ANTI-LOCK BRAKE SYSTEM

1996 BRAKES General Motors Corp. - Anti-Lock - Bosch 2U

DESCRIPTION

The Bosch 2U Anti-Lock Brake System (ABS) is designed to prevent wheel lock-up during heavy braking. This provides improved driver control and reduces distance required to stop vehicle.

Major system components include Electronic Brake Control Module (EBCM), speed sensors mounted at each front wheel, one rear speed sensor mounted in rear axle differential case, 2 instrument cluster warning indicators and Brake Pressure Modulator (BPM) valve assembly. Brake pressure modulator assembly houses electric pump motor and solenoid valves.

NOTE: For more information on brake system, see BRAKE SYSTEM article.

OPERATION

During normal driving and braking operations, ABS acts like a conventional braking system. Each wheel sensor constantly sends an AC voltage signal to Electronic Brake Control Module (EBCM). This information is translated to wheel rotation speed. When EBCM detects wheel lock-up is about to occur, it activates appropriate solenoid to pulse on and off rapidly, regulating hydraulic pressure to each wheel. A slight pulsation should be felt through brake pedal, indicating ABS is working.

BRAKE warning indicator will come on when ignition switch is turned to START position and should go off when ignition switch is turned to ON position. ANTI-LOCK indicator comes on when ignition is turned on and goes out after approximately 2 seconds. If either indicator stays on more than 30 seconds after vehicle is started, system malfunction is indicated. See **DIAGNOSIS & TESTING**.

Red BRAKE warning indicator will activate if parking brake is applied or brake fluid is low. Amber ANTI-LOCK indicator is controlled by EBCM and comes on if problem is detected with ABS. When indicator is on, ABS is disabled and braking is accomplished by conventional brake system. If both warning indicators are on, check conventional brake system for hydraulic system failure.

CAUTION: See ANTI-LOCK BRAKE SAFETY PRECAUTIONS article in GENERAL INFORMATION before servicing anti-lock brake system.

BLEEDING BRAKE SYSTEM

NOTE: Brake system can be bled by either manual or pressure method. Use DOT 3 brake fluid only.

MANUAL BLEEDING PROCEDURE

1. Deplete vacuum reserve from power brake booster by depressing brake pedal several times with engine off. Fill master cylinder and keep at least half full during bleeding procedure. If master cylinder is not known or suspected to have air in bore, go to step 4). If master cylinder is known or suspected to have air in bore, go to next step.
2. Disconnect forward brakeline fitting at master cylinder. Allow fluid to flow from fitting. Tighten fitting to specification. See **TORQUE SPECIFICATIONS**. Have an assistant slowly depress and hold brake pedal. Loosen forward fitting. Tighten fitting while pedal is still at floor. Release brake pedal slowly. Wait 15 seconds.
3. Repeat step 2) until fluid is clear and free of air bubbles. Repeat procedure at other (rearmost) brakeline fitting on master cylinder. Master cylinder is now bled. If wheel cylinders/calipers are not suspected to have air in them, it is not necessary to bleed them.
4. If wheel cylinders/calipers are known or suspected to have air in them, raise and support vehicle. Remove bleeder valve cap from right rear wheel, place proper size box end wrench over bleeder valve. Attach one end of clear tube over valve and submerge other end in container partially filled with clean brake fluid.
5. Have an assistant slowly depress and hold brake pedal. Loosen bleeder valve to purge air from cylinder. Tighten bleeder valve and slowly release brake pedal. Wait 15 seconds. Repeat sequence until all air is removed.
6. Remove tube and wrench. Proceed to left rear, right front and left front wheels in this order. Fill master cylinder reservoir, and install cover.

PRESSURE BLEEDING PROCEDURE

1. Install Bleeder Adapter (J-29567) to brake master cylinder. Pressurize bleeder to 20-25 psi (1.41-1.76 kg/cm^2). Connect bleeder hose to adapter, and bleed air from adapter.
2. Raise and support vehicle. For rear drum brakes, manual override is required to permit fluid flow to front wheels when pressure bleeding. Use Proportioning Valve Depressor (J-39177) to hold valve stem of combination valve open during pressure bleeding.
3. Starting at right rear wheel, place proper size box end wrench over bleeder valve. Attach one end of clear tube over valve and submerge other end in container partially filled with clean brake fluid.
4. Loosen bleeder valve to purge air from cylinder. Tighten bleeder valve when air is no longer present in tube. Repeat sequence until all air is removed.
5. Remove tube and wrench. Proceed to left rear, then right front and finish at left front wheel. Remove bleeder adapter, fill master cylinder and replace cover.

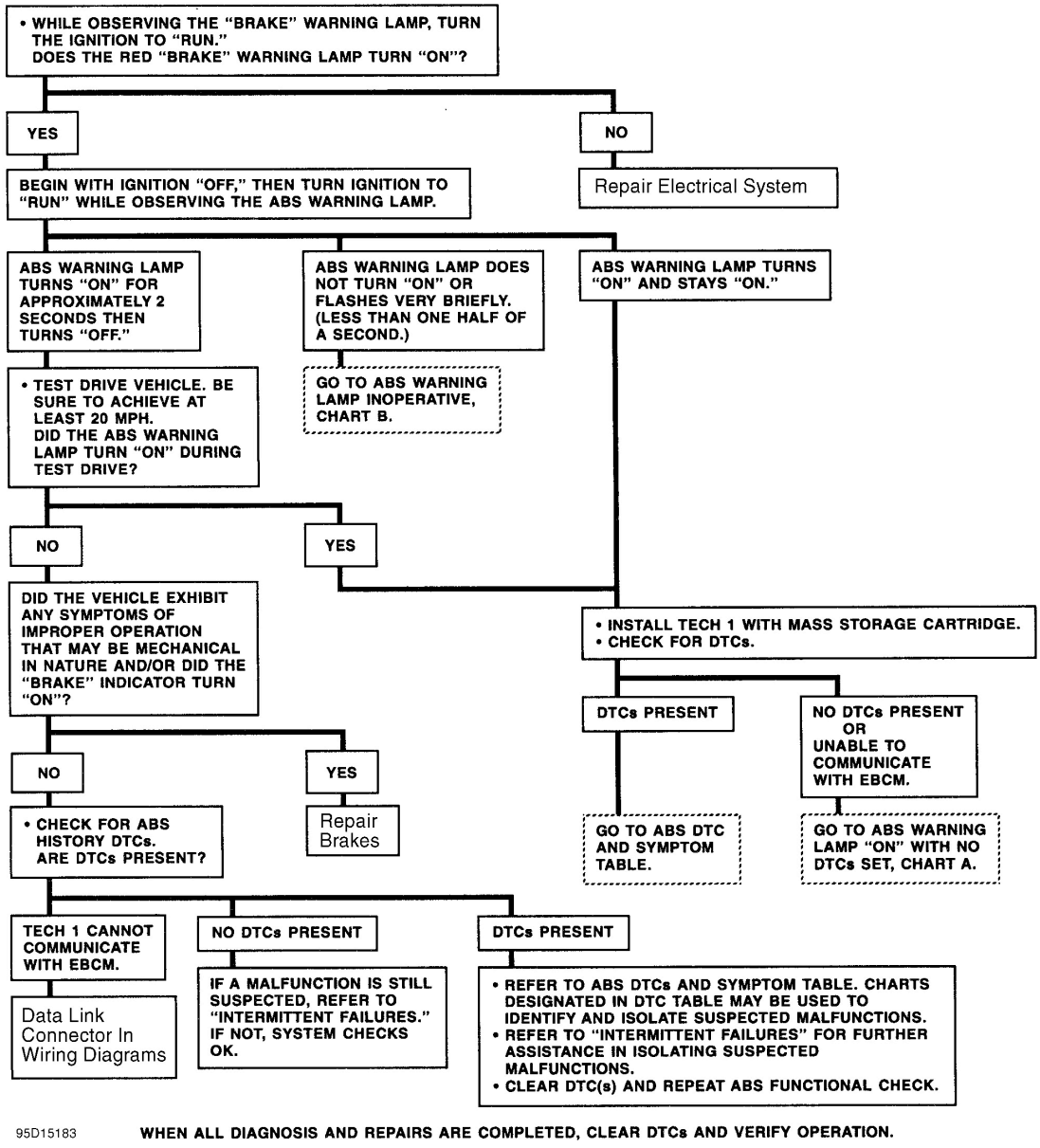
DIAGNOSIS

NOTE: When using Tech 1 for diagnostics, ABS system is disabled by EBCM. ANTI - LOCK indicator will come on indicating only normal power assisted braking is available. After diagnostics have been completed using Tech 1, disconnect Tech 1 from DLC connector and turn ignition off for a least 10 seconds before road testing vehicle. This procedure is done to reset EBCM.

PRE-DIAGNOSTIC INSPECTION

When checking potential ABS system faults, check following before using DIAGNOSTIC TROUBLE CODE (DTC) CHARTS:

1. Check fuses No. 5, 11 and 37 in main fuse block.
2. Check fusible link to brake pressure modulator.
3. Ensure Electronic Brake Control Module (EBCM) connector is fully seated and tight.
4. Ensure parking brake switch is functioning properly.
5. Check ABS ground circuit for clean tight connections. Ground is located on front of left cylinder head.
6. Always perform ABS system functional check before using DIAGNOSTIC TROUBLE CODE CHARTS. See **Fig. 1**.


• WHILE OBSERVING THE "BRAKE" WARNING LAMP, TURN THE IGNITION TO "RUN." DOES THE RED "BRAKE" WARNING LAMP TURN "ON"?
YES
NO
Repair Electrical System
BEGIN WITH IGNITION "OFF," THEN TURN IGNITION TO "RUN" WHILE OBSERVING THE ABS WARNING LAMP.
ABS WARNING LAMP TURNS "ON" FOR APPROXIMATELY 2 SECONDS THEN TURNS "OFF."
ABS WARNING LAMP DOES NOT TURN "ON" OR FLASHES VERY BRIEFLY. (LESS THAN ONE HALF OF A SECOND.)
ABS WARNING LAMP TURNS "ON" AND STAYS "ON."
GO TO ABS WARNING LAMP INOPERATIVE, CHART B.
• TEST DRIVE VEHICLE. BE SURE TO ACHIEVE AT LEAST 20 MPH. DID THE ABS WARNING LAMP TURN "ON" DURING TEST DRIVE?
NO
YES
DID THE VEHICLE EXHIBIT ANY SYMPTOMS OF IMPROPER OPERATION THAT MAY BE MECHANICAL IN NATURE AND/OR DID THE "BRAKE" INDICATOR TURN "ON"?
• INSTALL TECH 1 WITH MASS STORAGE CARTRIDGE.
• CHECK FOR DTCs.
DTCs PRESENT
NO DTCs PRESENT OR UNABLE TO COMMUNICATE WITH EBCM.
NO
YES
• CHECK FOR ABS HISTORY DTCs. ARE DTCs PRESENT?
Repair Brakes
GO TO ABS DTC AND SYMPTOM TABLE.
GO TO ABS WARNING LAMP "ON" WITH NO DTCs SET, CHART A.
TECH 1 CANNOT COMMUNICATE WITH EBCM.
NO DTCs PRESENT
DTCs PRESENT
Data Link Connector In Wiring Diagrams
IF A MALFUNCTION IS STILL SUSPECTED, REFER TO "INTERMITTENT FAILURES." IF NOT, SYSTEM CHECKS OK.
• REFER TO ABS DTCs AND SYMPTOM TABLE. CHARTS DESIGNATED IN DTC TABLE MAY BE USED TO IDENTIFY AND ISOLATE SUSPECTED MALFUNCTIONS.
• REFER TO "INTERMITTENT FAILURES" FOR FURTHER ASSISTANCE IN ISOLATING SUSPECTED MALFUNCTIONS.
• CLEAR DTC(s) AND REPEAT ABS FUNCTIONAL CHECK.
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WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY OPERATION.

Fig. 1: Anti-Lock Brake System Functional Check
Courtesy of GENERAL MOTORS CORP.

USING TECH 1

NOTE: Tech 1 Scan Tester (94-00101-A) with Bosch ABS DLC Adapter, Pinout Boxes (J-35592 and J-41247) and High-Impedance Digital Multimeter (J-39200) will be needed to test ABS system.

Proper Mass Storage Cartridge (MSC) must be inserted in Tech 1 to perform diagnostic procedures on anti-lock brake system. Plug Tech 1 into DLC connector before turning ignition on. A Bosch ABS adapter is required

when testing Bosch 2U anti-lock brake system.

Selecting Vehicle

Using Tech 1 function keys, select appropriate model year. After selecting model year, enter type of vehicle being tested. Press NO until "B" is flashing. Pressing EXIT will return Tech 1 to previous screen.

Selecting Test Mode

Five test modes are available for diagnosing anti-lock brake system. Test modes are:

Mode F0 (Data List)

Mode displays actual reading which each wheel speed sensor is sending to EBCM. In this mode, vehicle can be driven and wheel speed information can be observed to determine if readings are comparable to actual vehicle speed. By pressing brake pedal, status of brakelight switch can be observed.

Mode F1 (Code History)

Mode displays DTCs and description. EBCM keeps track of ignition cycles since DTC occurred. Ignition cycle information is useful in determining reason vehicle is in for service. If display indicates zero ignition cycles since DTC was set, fault is currently present. Vehicle speed information can be used to duplicate fault if an intermittent fault condition caused DTC to set. History information on up to 3 DTCs can be stored.

Mode F2 (Diagnostic Trouble Codes)

Mode displays ABS trouble codes. Tech 1 will display any DTCs and brief description of DTC displayed. If no DTC is stored, Tech 1 will display NO ABS CODES. Go to **SYMPTOM DIAGNOSIS**. Tech 1 will respond to a clear DTCs command by indicating ABS CODES CLEARED or CODE CLEAR FAIL.

Mode F3 (ABS Snapshot)

Mode helps isolate intermittent problems by capturing data before and after fault condition.

If MANUAL TRIGGER mode is selected, Tech 1 will wait for ENTER to be pressed before storing speed sensor information. All stored information can be displayed and examined for conditions which might indicate a problem.

If AUTOMATIC TRIGGER mode is selected, Tech 1 will capture data which deviates from normal conditions but may not set a DTC, such as driving over bumpy roads or railroad tracks. Condition may be caused by loose connections or intermittent wiring problems. While Tech 1 is waiting for a trigger, ENTER or F9 key may be used to force a trigger.

Mode F4 (Misc Test)

This mode is used to perform following tests:

- SOLENOID VALVE PRESSURE HOLD TEST
- SOLENOID VALVE PRESSURE RELEASE TEST
- AUTOMATIC TESTS

By selecting appropriate test and observing results, error conditions and faults can be further identified.

Solenoid Valve Pressure Hold Test

1. Raise vehicle on frame contact hoist so wheels to be tested are off ground. Turn ignition on. Using Tech 1, select F4: MISC TESTS and then F0: SOLENOID TESTS. Select solenoid to be tested. Select PRESSURE HOLD mode.
2. Have assistant apply brakes. Try to spin wheel being tested. While in PRESSURE HOLD mode, wheel should spin even with brakes applied. Repeat test if necessary to verify proper operation. Perform SOLENOID VALVE PRESSURE RELEASE TEST.

Solenoid Valve Pressure Release Test

1. Raise vehicle on frame contact hoist so wheels to be tested are off ground. Have assistant apply brakes. Turn ignition on. Using Tech 1, select F4: MISC TESTS and then F0: SOLENOID TESTS. Select solenoid to be tested. Select PRESSURE RELEASE mode.
2. Try to spin wheel being tested. Wheel should spin freely. Repeat test if necessary to verify proper operation. Perform SOLENOID VALVE PRESSURE HOLD TEST if test has not yet been performed.

Automatic Tests

Turn ignition on. Using Tech 1, select F4: MISC TESTS and then F1: AUTO TEST. Press ENTER when ready. Valves can be heard and felt cycling from hydraulic control unit. Have assistant verify pump motor is turned on. See **DIAGNOSTIC TROUBLE CODE (DTC)** table if DTCs are set. See **DIAGNOSTIC TROUBLE CODE CHARTS**. After all diagnosis and repairs are completed, clear DTCs and verify operation. AUTO test is performed automatically by EBCM once during each ignition cycle when vehicle reaches approximately 4 MPH.

DIAGNOSTIC TROUBLE CODE (DTC)

DTC	(1) Definition
12	Diagnostic System Operational
21	Right Front Wheel Speed Sensor Circuit
23	Right Front Wheel Speed Sensor Continuity
25	Left Front Wheel Speed Sensor Circuit
27	Left Front Wheel Speed Sensor Continuity
28	Wheel Speed Sensor Frequency Error
35	Rear Axle (Wheel) Speed Sensor Circuit
37	Rear Axle (Wheel) Speed Sensor Continuity
41	Right Front Inlet Solenoid Valve Fault
42	Right Front Outlet Solenoid Valve Fault

45	Left Front Inlet Solenoid Valve Fault
46	Left Front Outlet Solenoid Valve Fault
55	Rear Inlet Solenoid Valve Fault
56	Rear Outlet Solenoid Valve Fault
61	Pump Motor Or Relay Fault
63	Solenoid Valve Relay Fault
71	EBCM Fault
85	Low Voltage

(1) Always perform ABS system functional check before using DIAGNOSTIC TROUBLE CODE CHARTS. See **Fig. 1**.

CLEARING DIAGNOSTIC TROUBLE CODES

NOTE: Following 2 methods can be used to clear codes.

Tech 1 CLEAR CODES Selection

1. Connect Tech 1 scan tester. See USING TECH 1. Before clearing DTCs, check and note history DTC data. Select appropriate menu and CLEAR CODES function.
2. Verify DTCs are cleared. DTC 12 should be only DTC displayed. If other DTCs are displayed, either DTCs were not cleared or ABS fault still exists. Correct fault, and repeat procedure.

Ignition Cycle Default

If vehicle power is cycled 100 times without any particular fault reappearing, DTC will be erased from EBCM memory. Ignition cycle counter inside EBCM will reset to zero.

SYMPTOM DIAGNOSIS

If no DTCs are stored, use appropriate **SYMPTOM DIAGNOSTIC CHARTS** if necessary. See SYMPTOM DIAGNOSTIC CHART INDEX table.

SYMPTOM DIAGNOSTIC CHART INDEX

Symptom	(1) Chart
Anti-Lock Light On, No DTCs Set	"A"
Anti-Lock Light Inoperative Or Light Flashes Briefly At Ignition On	"B"

(1) See appropriate chart under **SYMPTOM DIAGNOSTIC CHARTS**.

INTERMITTENTS & POOR CONNECTIONS

Failures in anti-lock brake system may be difficult to diagnose accurately. If an ABS failure or fault occurs, ANTI-LOCK indicator will glow. If fault is an intermittent problem which has corrected itself (ANTI-LOCK indicator off), history DTC will be stored.

Stored history DTC will display history data of fault at time fault occurred. Tech 1 must be used to read ABS history data. ABS self-diagnostic system can be used to help find suspect circuit. To do so:

- Record current DTCs and DTC history information. Record any descriptive driving circumstances during failure occurrence.
- Use Tech 1, mode F3 (ABS snapshot), while test driving vehicle. See USING TECH 1. Try to duplicate fault condition.
- If no DTC is stored, use **SYMPTOM DIAGNOSTIC CHARTS** if necessary.

Most intermittent problems are caused by faulty electrical connectors or wiring. When an intermittent failure is encountered, inspect suspect circuits as follows:

- Check for poor mating of connector halves or terminals not fully seated in connector body (backed out).
- Check for improperly formed or damaged terminals. Carefully reform all connector terminals of problem circuit to increase contact tension.
- Check for poor terminal-to-wire connection. This requires removing terminal from connector body to inspect.

Electromagnetic Interference (EMI) Test

Due to sensitivity of ABS components to Electromagnetic Interference (EMI), the following checks should be made if an intermittent fault is suspected:

- Ensure proper installation of wiring harnesses from add-on options (police packages, etc.).
- Visually inspect wheel speed sensor and tooth ring for looseness, damage, accumulation of foreign material and proper mounting.
- Ensure proper routing of front wheel speed sensor wiring harness near spark plug wires.
- Measure resistance of spark plug wires. If resistance is more than 30,000 ohms, replace spark plug wires.
- While test driving vehicle, use Tech 1 to monitor wheel speeds. If any wheel speed drops or displays an erratic speed, refer to appropriate wheel speed DTC.

SYMPTOM DIAGNOSTIC CHARTS

SYMPTOM DIAGNOSTIC CHART "A" - ANTI-LOCK LIGHT ON, NO DTCS SET

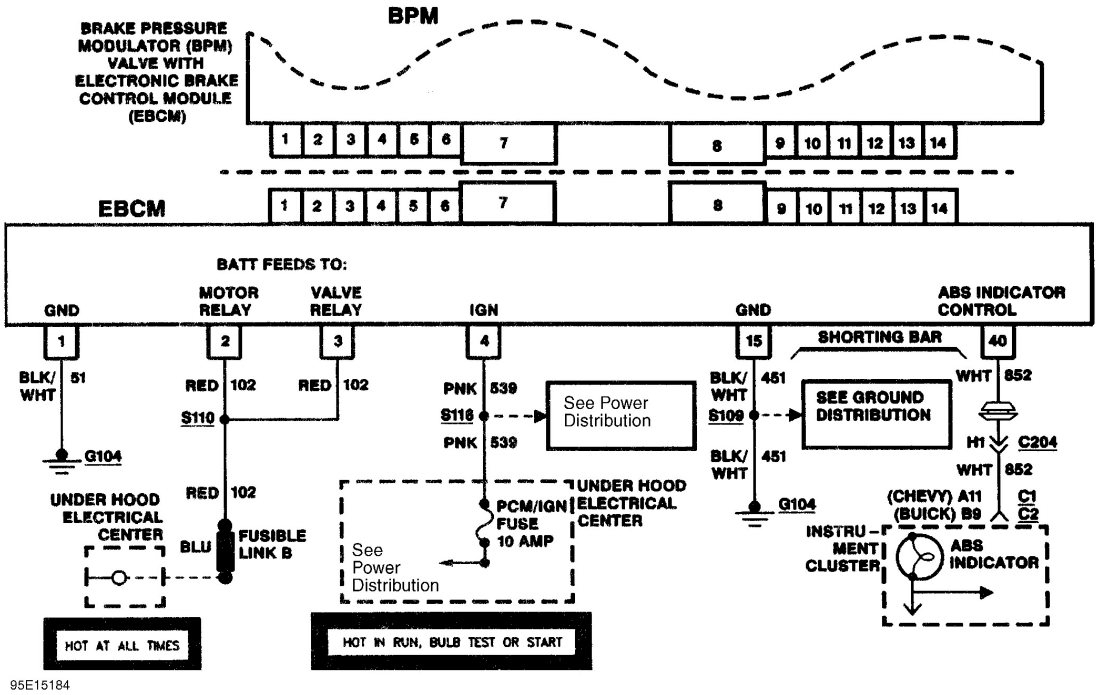

Fig. 2: Symptom Diagnostic Chart "A" - System Schematic
Courtesy of GENERAL MOTORS CORP.

ANTI-LOCK indicator is located on right side of instrument cluster. Battery voltage is supplied through fuse No. 11 and circuit No. 39. ANTI-LOCK indicator is grounded through circuit No. 852. Indicator is controlled by EBCM at pin No. 40.

EBCM supplies ground to indicator for approximately 2 seconds when ignition is first turned on. During first 2 seconds, EBCM will energize solenoid valve relay if no faults are detected. When relay is energized, ground circuit No. 852 through relay is open, allowing indicator to go off when EBCM indicator control line at pin No. 40 is opened.

NOTE: Test numbers refer to numbers on diagnostic chart.

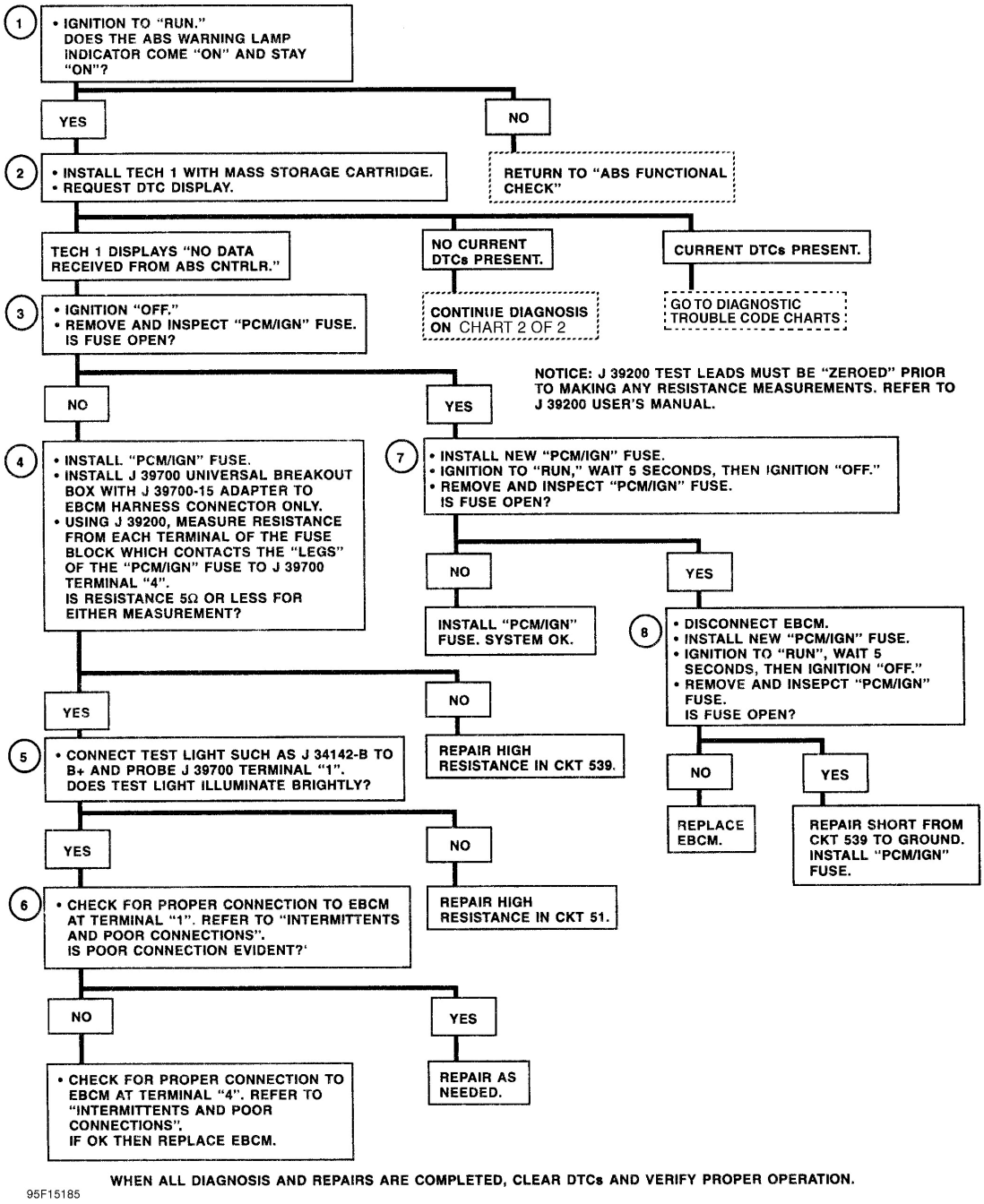
1
• IGNITION TO "RUN."
DOES THE ABS WARNING LAMP INDICATOR COME "ON" AND STAY "ON"?
YES
NO
2
• INSTALL TECH 1 WITH MASS STORAGE CARTRIDGE.
• REQUEST DTC DISPLAY.
RETURN TO "ABS FUNCTIONAL CHECK"
TECH 1 DISPLAYS "NO DATA RECEIVED FROM ABS CNTRLR."
NO CURRENT DTCs PRESENT.
CURRENT DTCs PRESENT.
3
• IGNITION "OFF."
• REMOVE AND INSPECT "PCM/IGN" FUSE.
IS FUSE OPEN?
CONTINUE DIAGNOSIS ON CHART 2 OF 2
GO TO DIAGNOSTIC TROUBLE CODE CHARTS
NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.
NO
YES
4
• INSTALL "PCM/IGN" FUSE.
• INSTALL J 39700 UNIVERSAL BREAKOUT BOX WITH J 39700-15 ADAPTER TO EBCM HARNESS CONNECTOR ONLY.
• USING J 39200, MEASURE RESISTANCE FROM EACH TERMINAL OF THE FUSE BLOCK WHICH CONTACTS THE "LEGS" OF THE "PCM/IGN" FUSE TO J 39700 TERMINAL "4".
IS RESISTANCE 5Ω OR LESS FOR EITHER MEASUREMENT?
7
• INSTALL NEW "PCM/IGN" FUSE.
• IGNITION TO "RUN," WAIT 5 SECONDS, THEN IGNITION "OFF."
• REMOVE AND INSPECT "PCM/IGN" FUSE.
IS FUSE OPEN?
NO
YES
INSTALL "PCM/IGN" FUSE. SYSTEM OK.
8
• DISCONNECT EBCM.
• INSTALL NEW "PCM/IGN" FUSE.
• IGNITION TO "RUN", WAIT 5 SECONDS, THEN IGNITION "OFF."
• REMOVE AND INSEPCT "PCM/IGN" FUSE.
IS FUSE OPEN?
YES
NO
NO
YES
5
• CONNECT TEST LIGHT SUCH AS J 34142-B TO B+ AND PROBE J 39700 TERMINAL "1".
DOES TEST LIGHT ILLUMINATE BRIGHTLY?
REPAIR HIGH RESISTANCE IN CKT 539.
REPLACE EBCM.
REPAIR SHORT FROM CKT 539 TO GROUND. INSTALL "PCM/IGN" FUSE.
YES
NO
6
• CHECK FOR PROPER CONNECTION TO EBCM AT TERMINAL "1". REFER TO "INTERMITTENTS AND POOR CONNECTIONS".
IS POOR CONNECTION EVIDENT?
REPAIR HIGH RESISTANCE IN CKT 51.
NO
YES
• CHECK FOR PROPER CONNECTION TO EBCM AT TERMINAL "4". REFER TO "INTERMITTENTS AND POOR CONNECTIONS".
IF OK THEN REPLACE EBCM.
REPAIR AS NEEDED.
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
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Fig. 3: Symptom Diagnostic Flow Chart "A" (1 Of 2)
Courtesy of GENERAL MOTORS CORP.

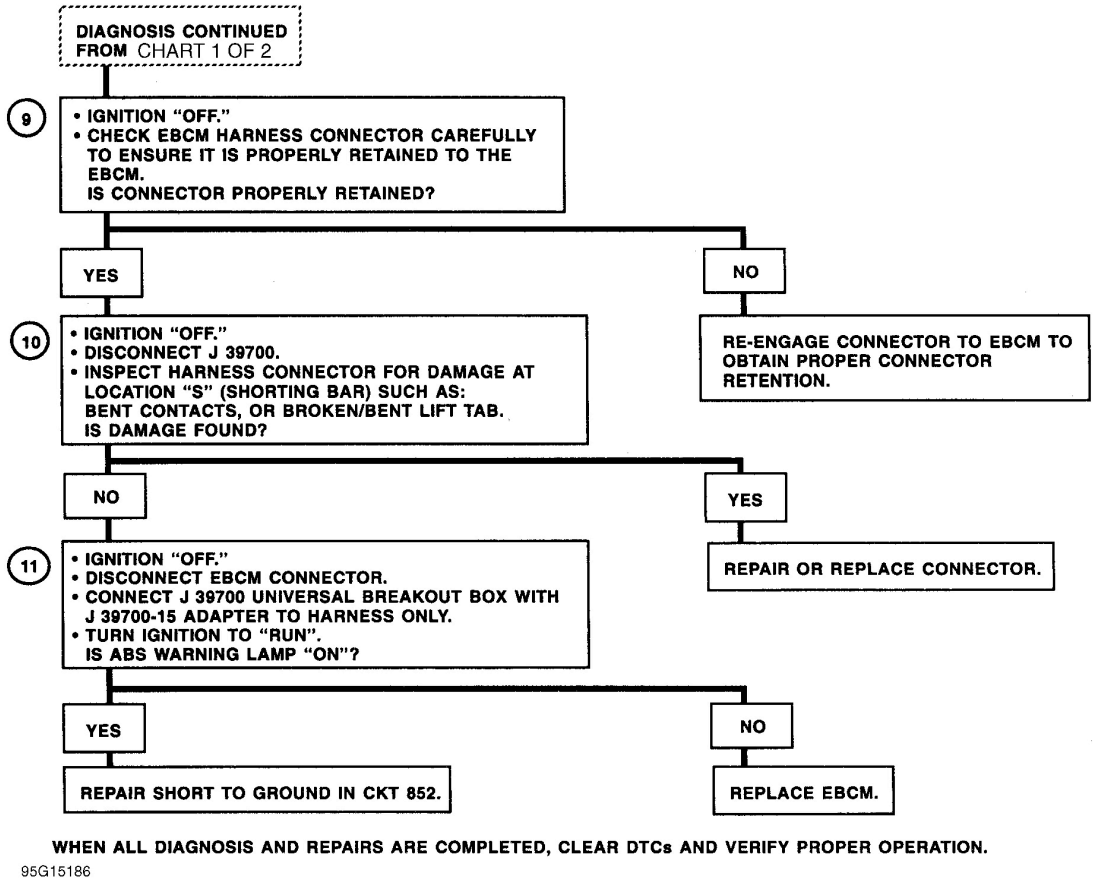
DIAGNOSIS CONTINUED FROM CHART 1 OF 2
9
• IGNITION "OFF."
• CHECK EBCM HARNESS CONNECTOR CAREFULLY TO ENSURE IT IS PROPERLY RETAINED TO THE EBCM.
IS CONNECTOR PROPERLY RETAINED?
YES
NO
10
• IGNITION "OFF."
• DISCONNECT J 39700.
• INSPECT HARNESS CONNECTOR FOR DAMAGE AT LOCATION "S" (SHORTING BAR) SUCH AS: BENT CONTACTS, OR BROKEN/BENT LIFT TAB.
IS DAMAGE FOUND?
RE-ENGAGE CONNECTOR TO EBCM TO OBTAIN PROPER CONNECTOR RETENTION.
NO
YES
11
• IGNITION "OFF."
• DISCONNECT EBCM CONNECTOR.
• CONNECT J 39700 UNIVERSAL BREAKOUT BOX WITH J 39700-15 ADAPTER TO HARNESS ONLY.
• TURN IGNITION TO "RUN".
IS ABS WARNING LAMP "ON"?
REPAIR OR REPLACE CONNECTOR.
YES
NO
REPAIR SHORT TO GROUND IN CKT 852.
REPLACE EBCM.
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
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Fig. 4: Symptom Diagnostic Flow Chart "A" (2 Of 2)
Courtesy of GENERAL MOTORS CORP.

1. Confirms that a fault condition exists.
2. Determines whether fault is due to a DTC setting condition, an indicator low side circuit fault, or an EBCM supply power fault.
3. Checks for an open power feed fuse.
4. Checks for an open power feed circuit.
5. Checks for an open ground circuit to EBCM.
6. Checks for proper connection of EBCM ground circuit.
7. Checks whether open fuse is due to a short to ground.
8. Determines whether short to ground is in circuit No. 539 or EBCM.
9. Checks for proper retention of EBCM connector.
10. Checks for damaged EBCM harness connector.
11. Checks for damaged connector (broken lift finger) on EBCM, or short to ground in circuit No. 852.

SYMPTOM DIAGNOSTIC CHART "B" - ANTI-LOCK LIGHT INOPERATIVE OR LIGHT

FLASHES BRIEFLY AT IGNITION ON

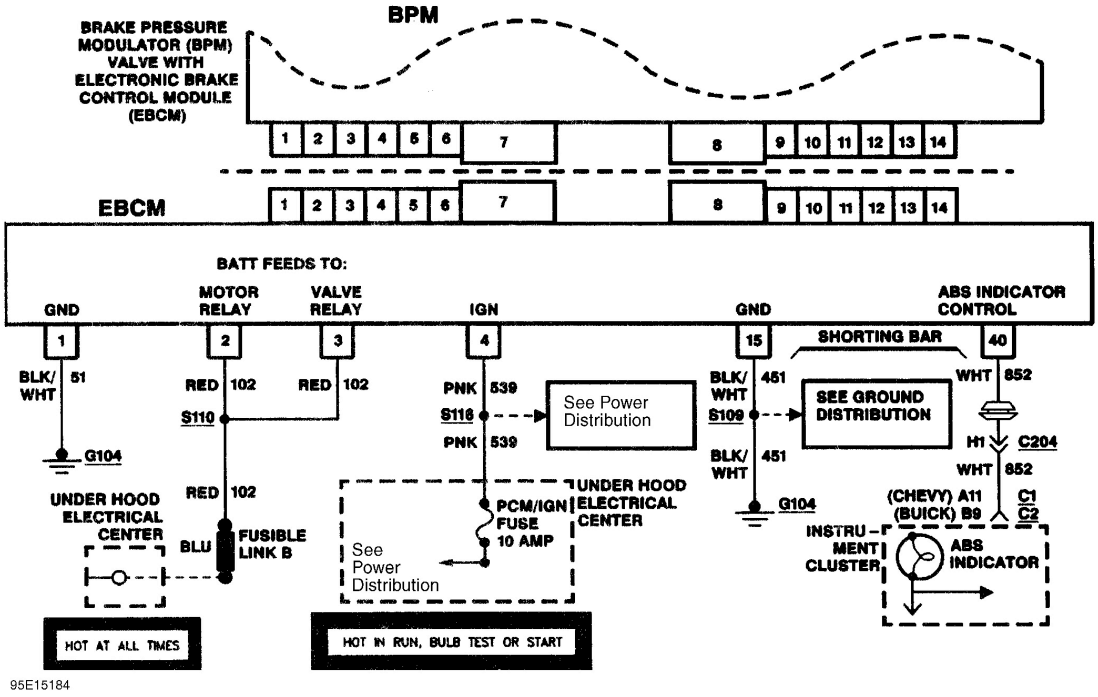

Fig. 5: Symptom Diagnostic Chart "B" - System Schematic
Courtesy of GENERAL MOTORS CORP.

ANTI-LOCK indicator is located on right side of instrument cluster. Battery voltage is supplied through fuse No. 11 and circuit No. 39. ANTI-LOCK indicator is grounded through circuit No. 852. Indicator is controlled by EBCM at pin No. 40.

EBCM supplies ground to indicator for approximately 2 seconds when ignition is first turned on. During first 2 seconds, EBCM will energize solenoid valve relay if no faults are detected. When relay is energized, ground circuit No. 852 through relay is open, allowing indicator to go off when EBCM indicator control line at pin No. 40 is opened.

NOTE: Test numbers refer to numbers on diagnostic chart.

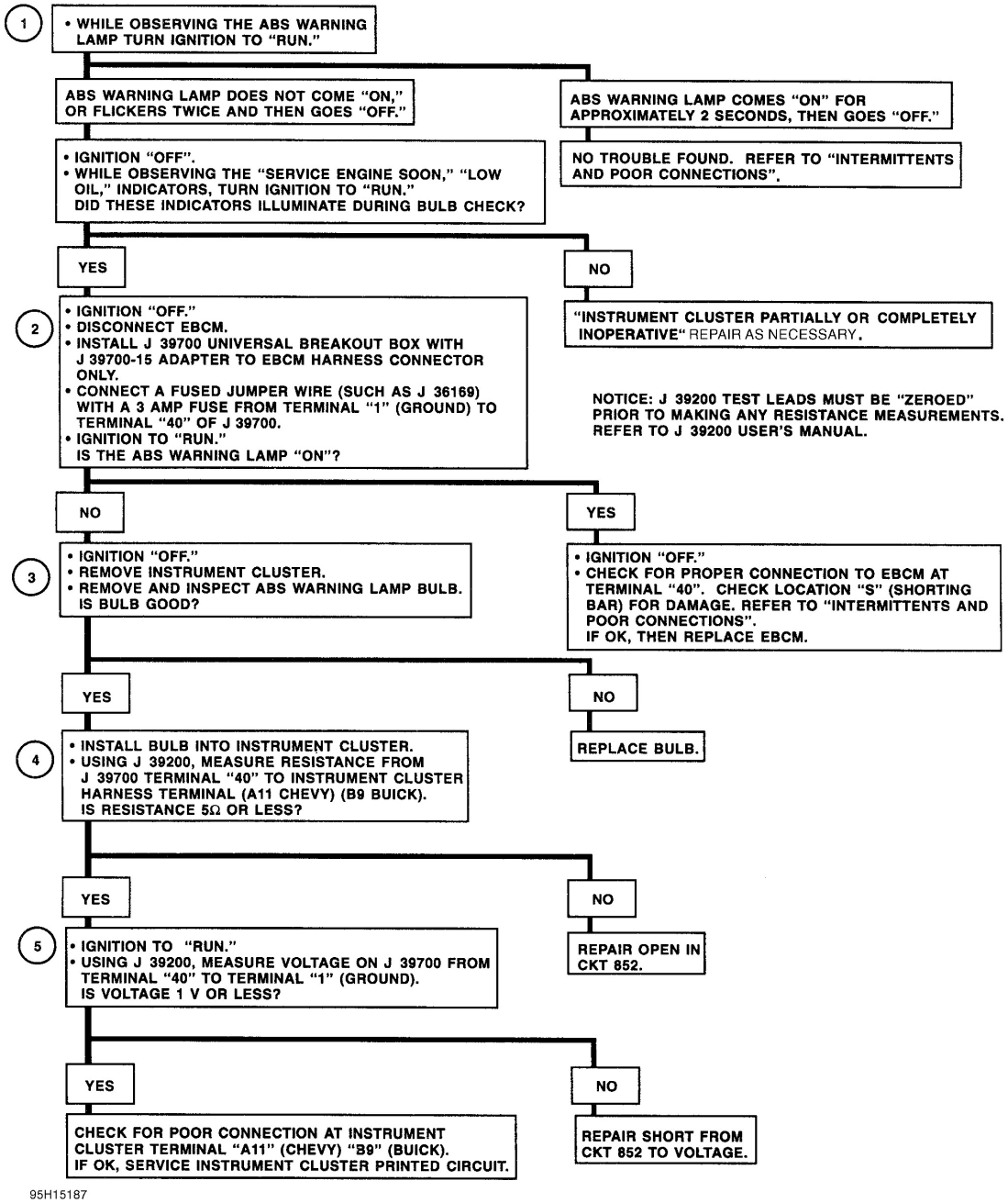
1
• WHILE OBSERVING THE ABS WARNING LAMP TURN IGNITION TO "RUN."
ABS WARNING LAMP DOES NOT COME "ON," OR FLICKERS TWICE AND THEN GOES "OFF."
ABS WARNING LAMP COMES "ON" FOR APPROXIMATELY 2 SECONDS, THEN GOES "OFF."
• IGNITION "OFF".
• WHILE OBSERVING THE "SERVICE ENGINE SOON," "LOW OIL," INDICATORS, TURN IGNITION TO "RUN."
DID THESE INDICATORS ILLUMINATE DURING BULB CHECK?
NO TROUBLE FOUND. REFER TO "INTERMITTENTS AND POOR CONNECTIONS".
YES
NO
2
• IGNITION "OFF."
• DISCONNECT EBCM.
• INSTALL J 39700 UNIVERSAL BREAKOUT BOX WITH J 39700-15 ADAPTER TO EBCM HARNESS CONNECTOR ONLY.
• CONNECT A FUSED JUMPER WIRE (SUCH AS J 36169) WITH A 3 AMP FUSE FROM TERMINAL "1" (GROUND) TO TERMINAL "40" OF J 39700.
• IGNITION TO "RUN."
IS THE ABS WARNING LAMP "ON"?
"INSTRUMENT CLUSTER PARTIALLY OR COMPLETELY INOPERATIVE" REPAIR AS NECESSARY.
NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.
NO
YES
3
• IGNITION "OFF."
• REMOVE INSTRUMENT CLUSTER.
• REMOVE AND INSPECT ABS WARNING LAMP BULB.
IS BULB GOOD?
• IGNITION "OFF."
• CHECK FOR PROPER CONNECTION TO EBCM AT TERMINAL "40". CHECK LOCATION "S" (SHORTING BAR) FOR DAMAGE. REFER TO "INTERMITTENTS AND POOR CONNECTIONS".
IF OK, THEN REPLACE EBCM.
YES
NO
4
• INSTALL BULB INTO INSTRUMENT CLUSTER.
• USING J 39200, MEASURE RESISTANCE FROM J 39700 TERMINAL "40" TO INSTRUMENT CLUSTER HARNESS TERMINAL (A11 CHEVY) (B9 BUICK).
IS RESISTANCE 5Ω OR LESS?
REPLACE BULB.
YES
NO
5
• IGNITION TO "RUN."
• USING J 39200, MEASURE VOLTAGE ON J 39700 FROM TERMINAL "40" TO TERMINAL "1" (GROUND).
IS VOLTAGE 1 V OR LESS?
REPAIR OPEN IN CKT 852.
YES
NO
CHECK FOR POOR CONNECTION AT INSTRUMENT CLUSTER TERMINAL "A11" (CHEVY) "B9" (BUICK).
IF OK, SERVICE INSTRUMENT CLUSTER PRINTED CIRCUIT.
REPAIR SHORT FROM CKT 852 TO VOLTAGE.
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Fig. 6: Symptom Diagnostic Flow Chart "B"
Courtesy of GENERAL MOTORS CORP.

1. Confirms that a fault condition exists.
2. Checks to see if indicator can be turned on manually.
3. Checks for bad indicator bulb.
4. Checks for indicator low side circuit open.

5. Checks for indicator low side circuit short to voltage.

DIAGNOSTIC TROUBLE CODE CHARTS

DTC 21 & DTC 25 - FRONT WHEEL SPEED SENSOR CIRCUIT FAULT

Toothed wheel generates a voltage pulse as it moves past sensor. EBCM uses these pulses to determine wheel speed. Amount of voltage generated in each pulse depends on wheel speed and air gap between sensor and toothed wheel.

EBCM uses wheel speed sensor signal to calculate vehicle reference speeds and individual speed, acceleration and slip values for each wheel. These values are used to determine when anti-lock control is needed.

DTC 21 or 25 will set if short to battery voltage or ground exists in circuit No. 833 or 872 (RF) or circuit No. 830 or 873 (LF). Faulty wheel speed sensor will also set DTC 21 or 25. Testing occurs when vehicle is moving. Fault will not set with ignition on and vehicle at rest.

If a fault is detected which causes a speed sensor DTC to set, anti-lock braking is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle. If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC will be present.

NOTE: To prevent electromagnetic interference, wheel speed sensor wires are twisted together 9 times per foot of wire. If repairs are necessary, ensure wires are properly twisted, routed and secured.

NOTE: Test numbers refer to numbers on diagnostic chart.

1. Checks for proper resistance of sensor.
2. Checks for short to voltage in either speed sensor circuit wire.
3. Checks for short between wheel speed sensor circuit wires.
4. Checks for short to ground in speed sensor input circuit wires. A short with a resistance less than 2 megohms, though not a hard short, can still cause DTCs to set.
5. Checks if DTC resets during road test.
6. Checks wiring and connectors for intermittents.
7. Replace wheel bearing/speed sensor assembly. If DTC resets, EBCM is concluding fault is present when no fault is present.
8. Ensures DTC is not due to electromagnetic interference.

Diagnostic Aids

Intermittent setting of wheel speed sensor DTCs may be caused by improperly mounted sensor or improper wire routing. Improper wire routing may also cause DTC 35 to be set. Ensure sensor is mounted correctly and sensor face does not contain an accumulation of metallic particles, dirt or grease.

To aid in trouble shooting intermittent conditions, use Tech 1 while road testing vehicle. During usage of Tech 1, ABS will be disabled. If intermittent is still not identified, wet speed sensor harness on underside of vehicle and road test while monitoring wheel speeds.

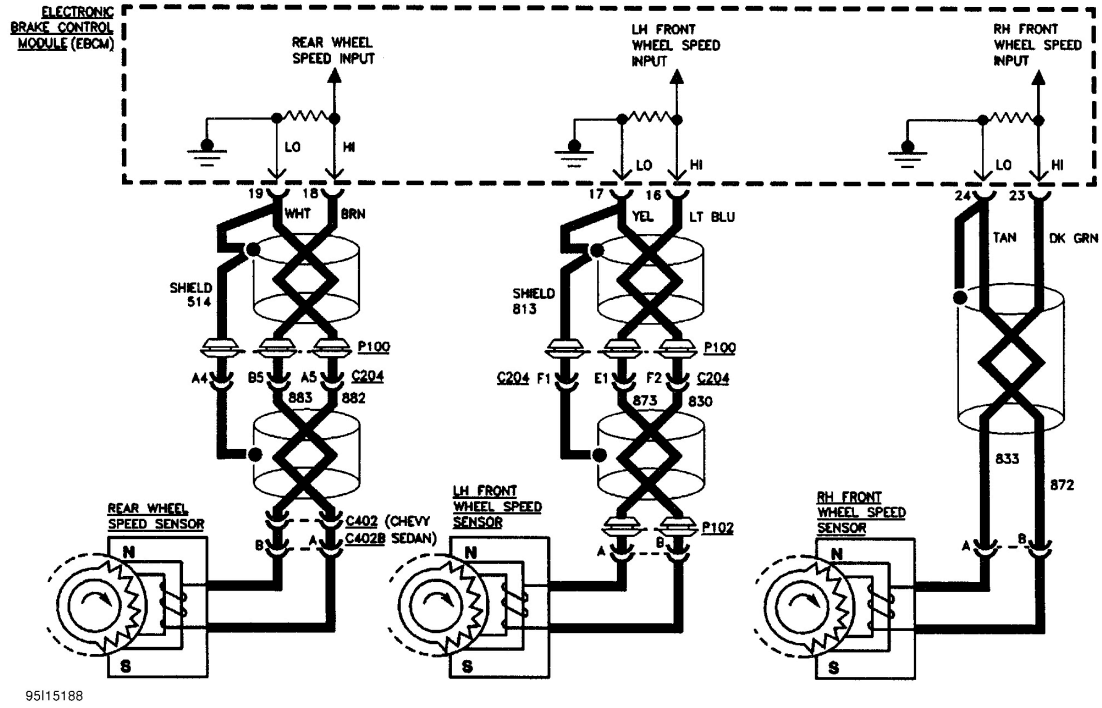

Fig. 7: Wheel Speed Sensor Circuit Diagram
Courtesy of GENERAL MOTORS CORP.

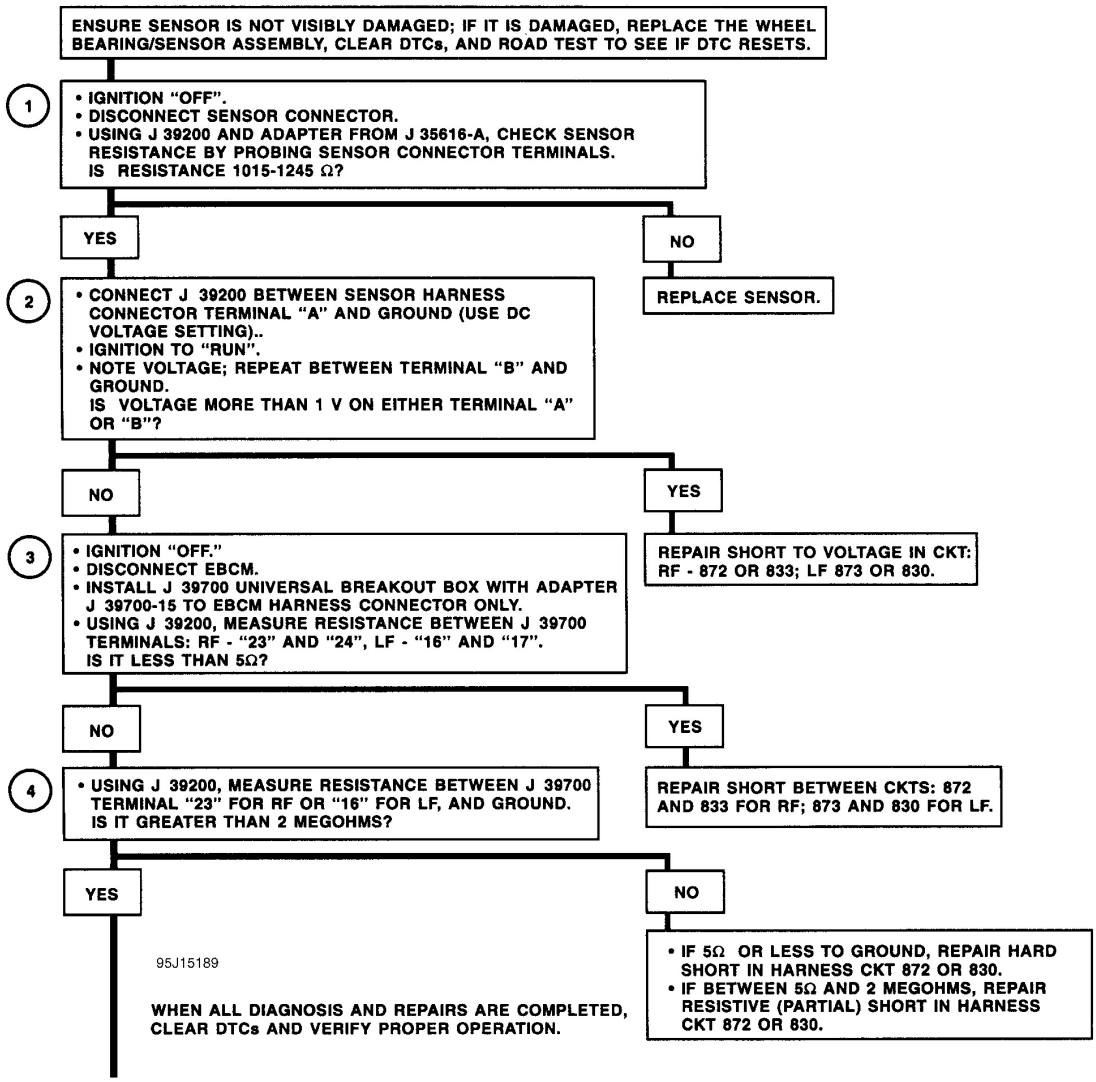
ENSURE SENSOR IS NOT VISIBLY DAMAGED; IF IT IS DAMAGED, REPLACE THE WHEEL BEARING/SENSOR ASSEMBLY, CLEAR DTCs, AND ROAD TEST TO SEE IF DTC RESETS.
1
• IGNITION "OFF".
• DISCONNECT SENSOR CONNECTOR.
• USING J 39200 AND ADAPTER FROM J 35616-A, CHECK SENSOR RESISTANCE BY PROBING SENSOR CONNECTOR TERMINALS.
IS RESISTANCE 1015-1245 Ω?
YES
NO
REPLACE SENSOR.
2
• CONNECT J 39200 BETWEEN SENSOR HARNESS CONNECTOR TERMINAL "A" AND GROUND (USE DC VOLTAGE SETTING)..
• IGNITION TO "RUN".
• NOTE VOLTAGE; REPEAT BETWEEN TERMINAL "B" AND GROUND.
IS VOLTAGE MORE THAN 1 V ON EITHER TERMINAL "A" OR "B"?
NO
YES
REPAIR SHORT TO VOLTAGE IN CKT: RF - 872 OR 833; LF 873 OR 830.
3
• IGNITION "OFF."
• DISCONNECT EBCM.
• INSTALL J 39700 UNIVERSAL BREAKOUT BOX WITH ADAPTER J 39700-15 TO EBCM HARNESS CONNECTOR ONLY.
• USING J 39200, MEASURE RESISTANCE BETWEEN J 39700 TERMINALS: RF - "23" AND "24", LF - "16" AND "17".
IS IT LESS THAN 5Ω?
NO
YES
REPAIR SHORT BETWEEN CKTS: 872 AND 833 FOR RF; 873 AND 830 FOR LF.
4
• USING J 39200, MEASURE RESISTANCE BETWEEN J 39700 TERMINAL "23" FOR RF OR "16" FOR LF, AND GROUND.
IS IT GREATER THAN 2 MEGOHMS?
YES
NO
• IF 5Ω OR LESS TO GROUND, REPAIR HARD SHORT IN HARNESS CKT 872 OR 830.
• IF BETWEEN 5Ω AND 2 MEGOHMS, REPAIR RESISTIVE (PARTIAL) SHORT IN HARNESS CKT 872 OR 830.
95J15189
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.

Fig. 8: DTC 21 & 25 Diagnostic Flow Chart (1 Of 2)
Courtesy of GENERAL MOTORS CORP.

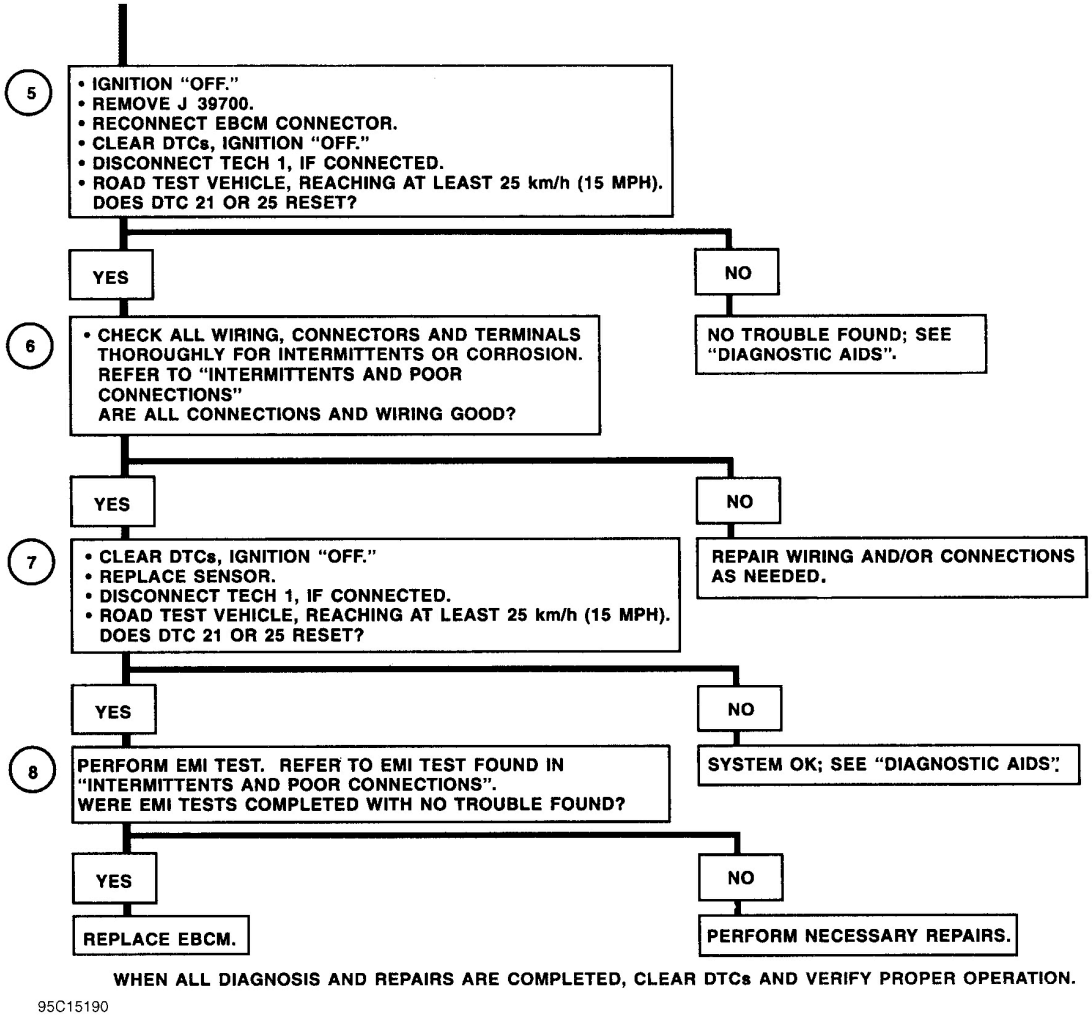
5
• IGNITION "OFF."
• REMOVE J 39700.
• RECONNECT EBCM CONNECTOR.
• CLEAR DTCs, IGNITION "OFF."
• DISCONNECT TECH 1, IF CONNECTED.
• ROAD TEST VEHICLE, REACHING AT LEAST 25 km/h (15 MPH). DOES DTC 21 OR 25 RESET?
YES
NO
6
• CHECK ALL WIRING, CONNECTORS AND TERMINALS THOROUGHLY FOR INTERMITTENTS OR CORROSION. REFER TO "INTERMITTENTS AND POOR CONNECTIONS" ARE ALL CONNECTIONS AND WIRING GOOD?
NO TROUBLE FOUND; SEE "DIAGNOSTIC AIDS".
YES
NO
7
• CLEAR DTCs, IGNITION "OFF."
• REPLACE SENSOR.
• DISCONNECT TECH 1, IF CONNECTED.
• ROAD TEST VEHICLE, REACHING AT LEAST 25 km/h (15 MPH). DOES DTC 21 OR 25 RESET?
REPAIR WIRING AND/OR CONNECTIONS AS NEEDED.
YES
NO
8
PERFORM EMI TEST. REFER TO EMI TEST FOUND IN "INTERMITTENTS AND POOR CONNECTIONS". WERE EMI TESTS COMPLETED WITH NO TROUBLE FOUND?
SYSTEM OK; SEE "DIAGNOSTIC AIDS".
YES
NO
REPLACE EBCM.
PERFORM NECESSARY REPAIRS.
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
95C15190

Fig. 9: DTC 21 & 25 Diagnostic Flow Chart (2 Of 2)
Courtesy of GENERAL MOTORS CORP.

DTC 23, DTC 27 & DTC 37 - WHEEL SPEED SENSOR CONTINUITY FAULT

Toothed wheel generates a voltage pulse as it moves past sensor. EBCM uses the frequency of these pulses to determine wheel speed. Amount of voltage generated in each pulse depends on wheel speed and air gap between sensor and toothed wheel. See **Fig. 7**.

DTC will set when there is a short to battery voltage or open in the affected circuit, or if wheel speed sensor is malfunctioning. Testing occurs with ignition on and vehicle at rest.

If a fault is detected which causes a speed sensor DTC to set, anti-lock braking is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle. If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC will be present.

NOTE: Test numbers refer to numbers on diagnostic chart.

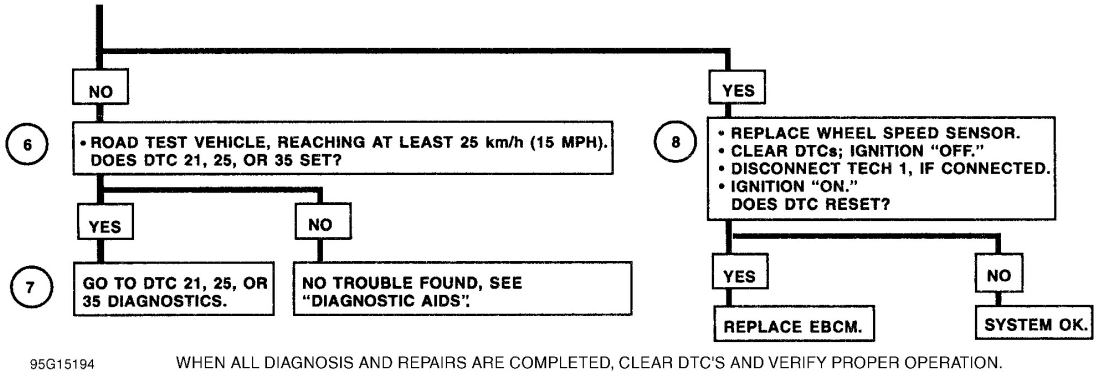

Fig. 10: DTC 23, 27 & 37 Diagnostic Flow Chart
Courtesy of GENERAL MOTORS CORP.

1. Checks for proper resistance of sensor.
2. Checks for short to battery voltage in either speed sensor circuit wire.
3. Checks for open in both speed sensor circuit wires.
4. Checks wiring and connectors for intermittents.
5. Checks if DTC resets during key-up. If DTC resets, wheel bearing/speed sensor assembly may be causing DTC.
6. Checks if DTC 21, 25, or 35 sets during road test.
7. DTC 21, 25, or 35 will set with vehicle in motion. DTC 23, 27, or 37 will set with vehicle at rest. If DTC 21, 25, or 35 sets, go to appropriate chart.
8. Replace wheel bearing/speed sensor assembly. If DTC resets, EBCM is concluding fault is present when no fault is present.

Diagnostic Aids

To help prevent false signals due to electrical noise being picked up by circuit wiring, ensure wiring is properly routed and retained. To prevent misdiagnosis, conduct thorough inspection of wiring and connectors.

DTC 28 - WHEEL SPEED SENSOR FREQUENCY ERROR

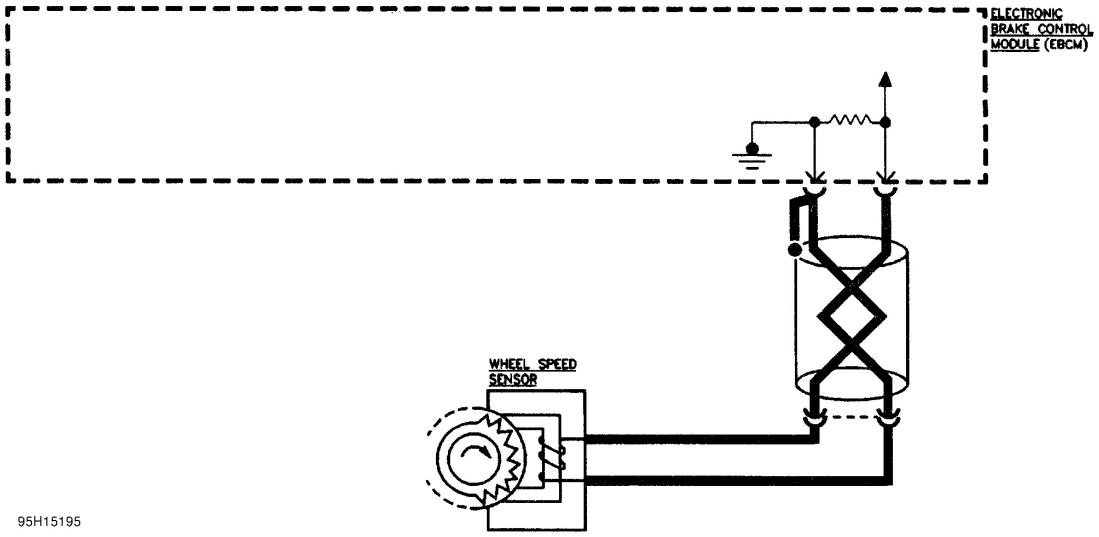

Fig. 11: Wheel Speed Sensor Schematic
Courtesy of GENERAL MOTORS CORP.

Toothed wheel generates a voltage pulse as it moves past sensor. EBCM uses the frequency of these pulses to determine wheel speed. Amount of voltage generated in each pulse depends on wheel speed and air gap between sensor and toothed wheel.

DTC 28 will set if EBCM cannot specifically identify which wheel speed sensor is causing frequency error. If EBCM can identify specific wheel speed sensor causing trouble, DTC for that sensor (DTC 21, 25, or 35) will be set instead of DTC 28.

If DTC 28 is set, anti-lock braking is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle. If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC 28 will be present.

NOTE: Test numbers refer to numbers on diagnostic chart.

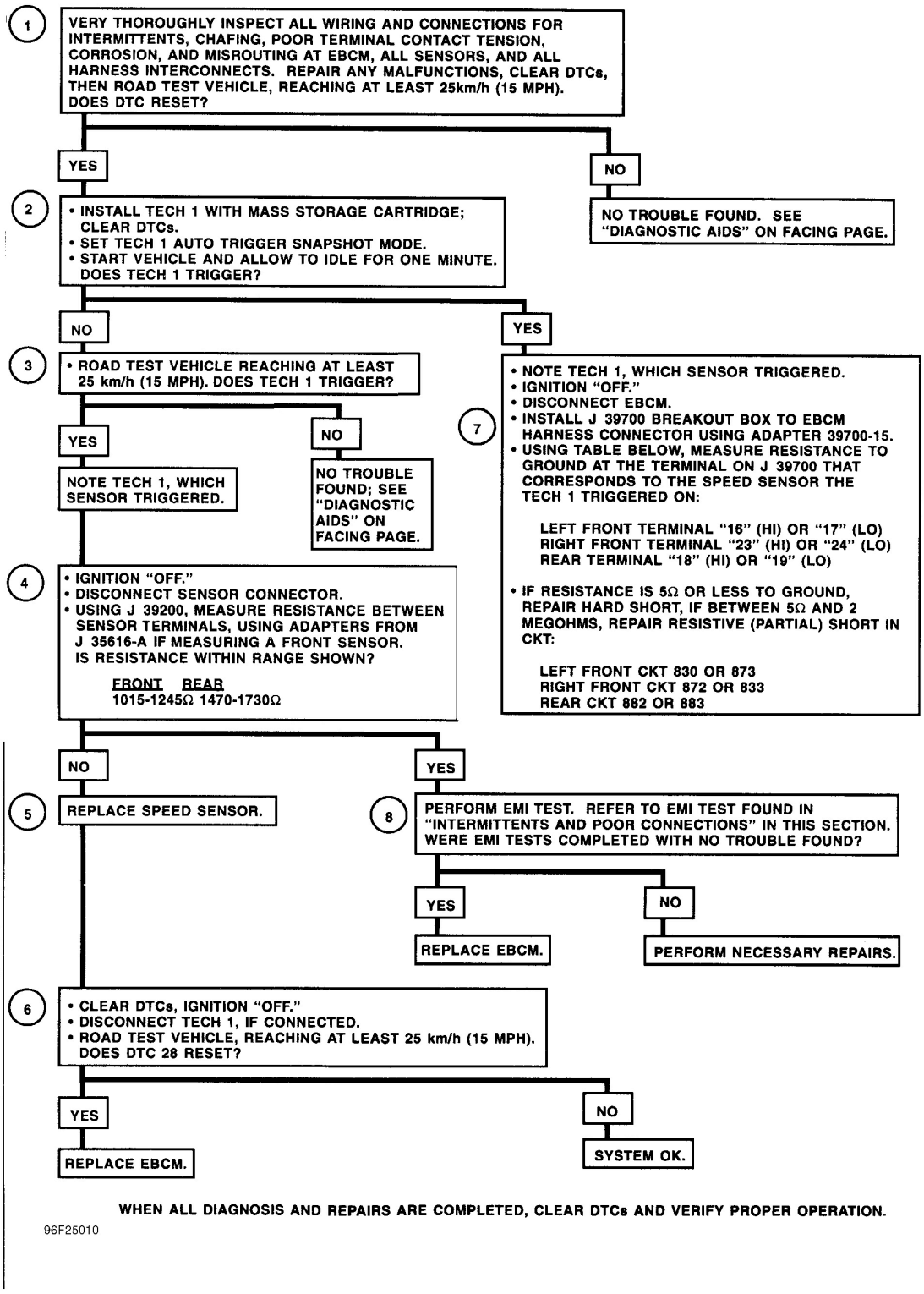
1
VERY THOROUGHLY INSPECT ALL WIRING AND CONNECTIONS FOR INTERMITTENTS, CHAFING, POOR TERMINAL CONTACT TENSION, CORROSION, AND MISROUTING AT EBCM, ALL SENSORS, AND ALL HARNESS INTERCONNECTS. REPAIR ANY MALFUNCTIONS, CLEAR DTCs, THEN ROAD TEST VEHICLE, REACHING AT LEAST 25km/h (15 MPH). DOES DTC RESET?
YES
NO
NO TROUBLE FOUND. SEE "DIAGNOSTIC AIDS" ON FACING PAGE.
2
• INSTALL TECH 1 WITH MASS STORAGE CARTRIDGE; CLEAR DTCs.
• SET TECH 1 AUTO TRIGGER SNAPSHOT MODE.
• START VEHICLE AND ALLOW TO IDLE FOR ONE MINUTE. DOES TECH 1 TRIGGER?
NO
YES
3
• ROAD TEST VEHICLE REACHING AT LEAST 25 km/h (15 MPH). DOES TECH 1 TRIGGER?
YES
NO
NOTE TECH 1, WHICH SENSOR TRIGGERED.
NO TROUBLE FOUND; SEE "DIAGNOSTIC AIDS" ON FACING PAGE.
7
• NOTE TECH 1, WHICH SENSOR TRIGGERED.
• IGNITION "OFF."
• DISCONNECT EBCM.
• INSTALL J 39700 BREAKOUT BOX TO EBCM HARNESS CONNECTOR USING ADAPTER 39700-15.
• USING TABLE BELOW, MEASURE RESISTANCE TO GROUND AT THE TERMINAL ON J 39700 THAT CORRESPONDS TO THE SPEED SENSOR THE TECH 1 TRIGGERED ON:
LEFT FRONT TERMINAL "16" (HI) OR "17" (LO)
RIGHT FRONT TERMINAL "23" (HI) OR "24" (LO)
REAR TERMINAL "18" (HI) OR "19" (LO)
• IF RESISTANCE IS 5Ω OR LESS TO GROUND, REPAIR HARD SHORT, IF BETWEEN 5Ω AND 2 MEGOHMS, REPAIR RESISTIVE (PARTIAL) SHORT IN CKT:
LEFT FRONT CKT 830 OR 873
RIGHT FRONT CKT 872 OR 833
REAR CKT 882 OR 883
4
• IGNITION "OFF."
• DISCONNECT SENSOR CONNECTOR.
• USING J 39200, MEASURE RESISTANCE BETWEEN SENSOR TERMINALS, USING ADAPTERS FROM J 35616-A IF MEASURING A FRONT SENSOR. IS RESISTANCE WITHIN RANGE SHOWN?
FRONT REAR
1015-1245Ω 1470-1730Ω
NO
YES
5
REPLACE SPEED SENSOR.
8
PERFORM EMI TEST. REFER TO EMI TEST FOUND IN "INTERMITTENTS AND POOR CONNECTIONS" IN THIS SECTION. WERE EMI TESTS COMPLETED WITH NO TROUBLE FOUND?
YES
NO
REPLACE EBCM.
PERFORM NECESSARY REPAIRS.
6
• CLEAR DTCs, IGNITION "OFF."
• DISCONNECT TECH 1, IF CONNECTED.
• ROAD TEST VEHICLE, REACHING AT LEAST 25 km/h (15 MPH). DOES DTC 28 RESET?
YES
NO
REPLACE EBCM.
SYSTEM OK.
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
96F25010

Fig. 12: DTC 28 Diagnostic Flow Chart
Courtesy of GENERAL MOTORS CORP.

1. Checks wiring and connectors. Performing this step is critical as wiring or connector malfunction is most likely cause for this DTC to set.
2. Monitors electrical system for noise picked up by wheel speed sensor circuits.
3. Monitors wheel speed sensors while vehicle is operating. If Tech 1 auto-trigger snapshot mode triggers, wheel speed sensor or wiring and/or connectors are going intermittent during road test.
4. Checks resistance of wheel speed sensor.
5. Replaces wheel speed sensor as most likely cause of intermittent.
6. Ensures DTC does not reset due to faulty EBCM.
7. Checks for short to ground in speed sensor input circuit wires. A short with a resistance of less than 2 megohms, though not a direct short, may set DTC 28.
8. Ensures DTC is not due to electromagnetic interference.

Diagnostic Aids

Check for build-up of foreign material in gaps between teeth on toothed sensor ring. Check toothed sensor ring for large grooves, gouges and marks which may influence sensor ring signal. Excessive play in hub/bearing assembly may cause DTC to set.

DTC 35 - REAR WHEEL SPEED SENSOR CIRCUIT FAULT

As differential pinion gear turns, toothed wheel (mounted on differential pinion gear) generates a voltage pulse as it moves past sensor. Frequency and voltage generated is proportional to rear axle speed. See **Fig. 7**.

EBCM uses rear axle (wheel) speed sensor signal to calculate vehicle reference speeds and individual speed, acceleration and slip values for rear wheels. These values are used to determine when anti-lock control is needed.

DTC 35 will set if short to battery voltage or ground exists in circuit No. 1810 or No. 1811. Faulty speed sensor will also set DTC 35. Testing occurs when vehicle is moving. DTC will not set with ignition on and vehicle at rest.

If DTC 35 is set, anti-lock braking is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle. If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC 35 will be present.

NOTE: To prevent electromagnetic interference, wheel speed sensor wires are twisted together 9 times per foot of wire. If repairs are necessary, ensure wires are properly twisted, routed and secured.

NOTE: Test numbers refer to numbers on diagnostic chart.

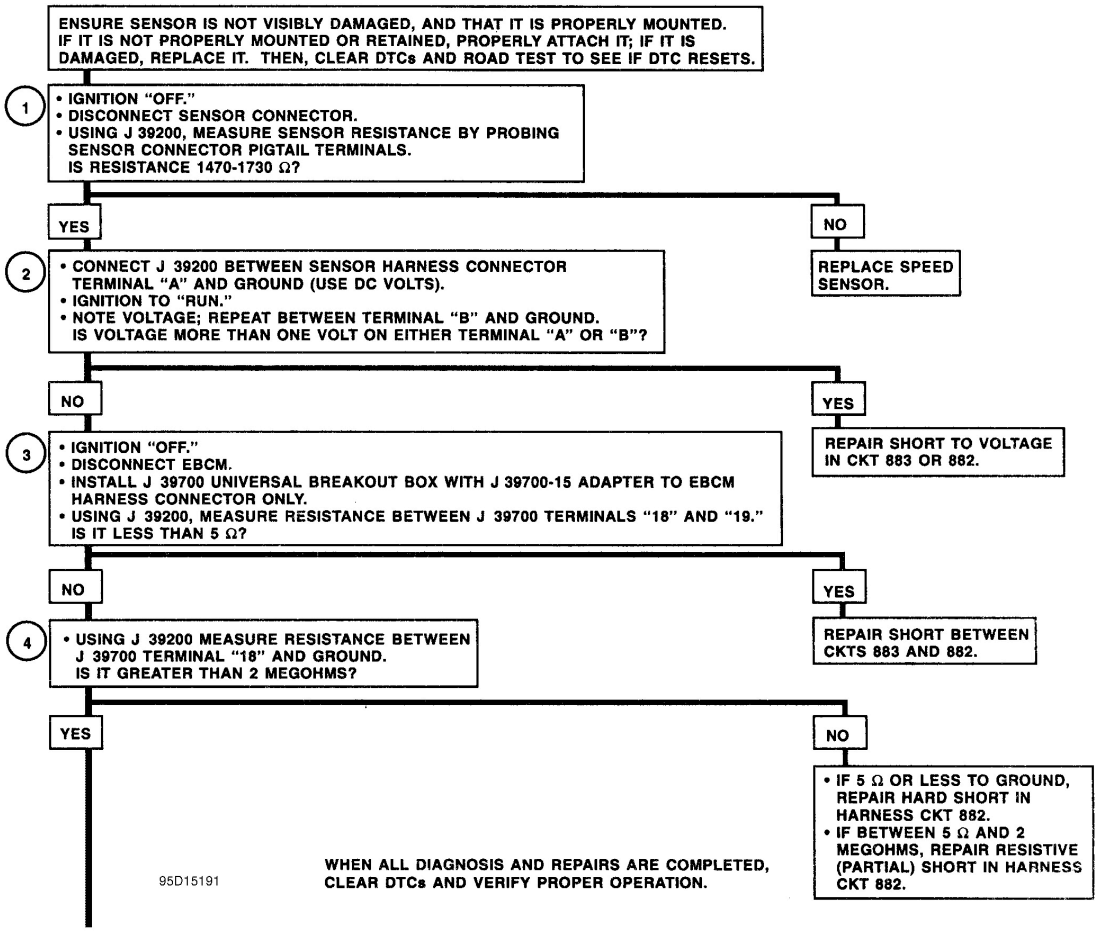
ENSURE SENSOR IS NOT VISIBLY DAMAGED, AND THAT IT IS PROPERLY MOUNTED. IF IT IS NOT PROPERLY MOUNTED OR RETAINED, PROPERLY ATTACH IT; IF IT IS DAMAGED, REPLACE IT. THEN, CLEAR DTCs AND ROAD TEST TO SEE IF DTC RESETS.
1
• IGNITION "OFF."
• DISCONNECT SENSOR CONNECTOR.
• USING J 39200, MEASURE SENSOR RESISTANCE BY PROBING SENSOR CONNECTOR PIGTAIL TERMINALS.
IS RESISTANCE 1470-1730 Ω?
YES
NO
REPLACE SPEED SENSOR.
2
• CONNECT J 39200 BETWEEN SENSOR HARNESS CONNECTOR TERMINAL "A" AND GROUND (USE DC VOLTS).
• IGNITION TO "RUN."
• NOTE VOLTAGE; REPEAT BETWEEN TERMINAL "B" AND GROUND.
IS VOLTAGE MORE THAN ONE VOLT ON EITHER TERMINAL "A" OR "B"?
NO
YES
REPAIR SHORT TO VOLTAGE IN CKT 883 OR 882.
3
• IGNITION "OFF."
• DISCONNECT EBCM.
• INSTALL J 39700 UNIVERSAL BREAKOUT BOX WITH J 39700-15 ADAPTER TO EBCM HARNESS CONNECTOR ONLY.
• USING J 39200, MEASURE RESISTANCE BETWEEN J 39700 TERMINALS "18" AND "19."
IS IT LESS THAN 5 Ω?
NO
YES
REPAIR SHORT BETWEEN CKTS 883 AND 882.
4
• USING J 39200 MEASURE RESISTANCE BETWEEN J 39700 TERMINAL "18" AND GROUND.
IS IT GREATER THAN 2 MEGOHMS?
YES
NO
• IF 5 Ω OR LESS TO GROUND, REPAIR HARD SHORT IN HARNESS CKT 882.
• IF BETWEEN 5 Ω AND 2 MEGOHMS, REPAIR RESISTIVE (PARTIAL) SHORT IN HARNESS CKT 882.
95D15191
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.

Fig. 13: DTC 35 Diagnostic Flow Chart - 1 Of 2
Courtesy of GENERAL MOTORS CORP.

1. Checks for proper resistance of sensor.
2. Checks for short to battery voltage in either speed sensor circuit wire.
3. Checks for short between speed sensor circuit wires.
4. Checks for short to ground in speed sensor input circuit wires. A short with resistance of less than 2 megohms, though not a direct short, may set DTC 35.

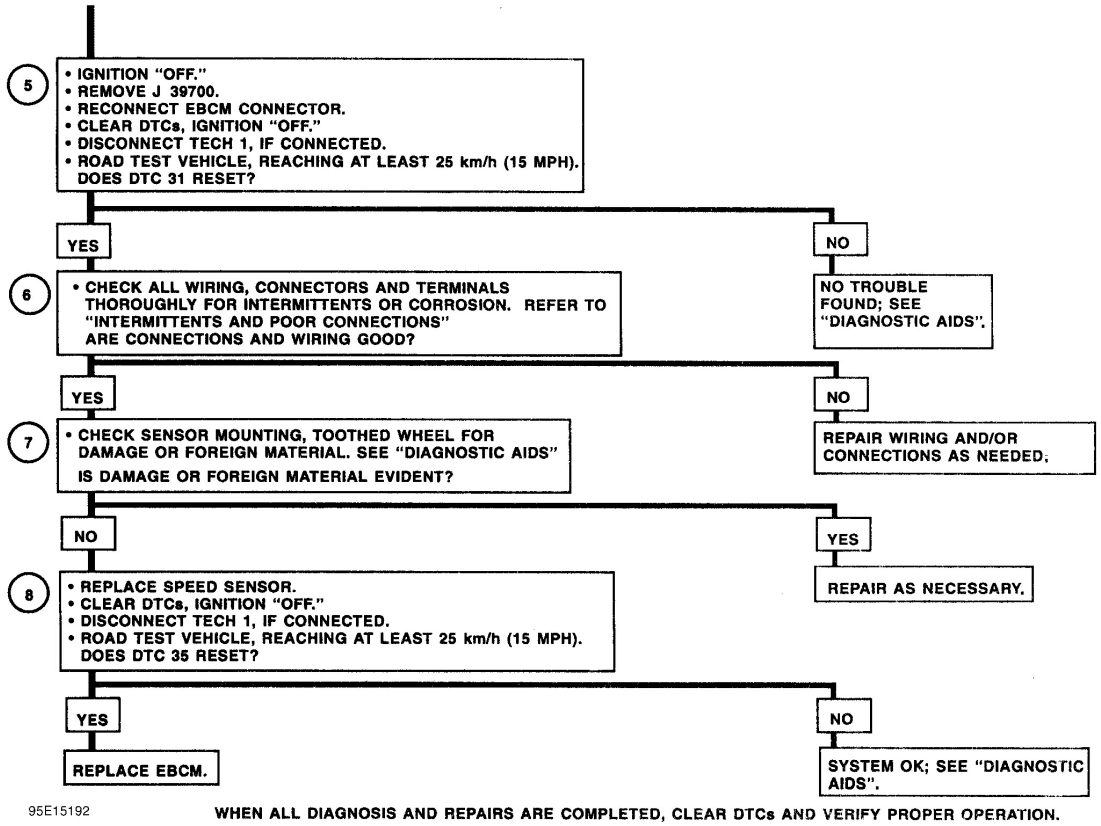
5
• IGNITION "OFF."
• REMOVE J 39700.
• RECONNECT EBCM CONNECTOR.
• CLEAR DTCs, IGNITION "OFF."
• DISCONNECT TECH 1, IF CONNECTED.
• ROAD TEST VEHICLE, REACHING AT LEAST 25 km/h (15 MPH).
DOES DTC 31 RESET?
YES
NO
6
• CHECK ALL WIRING, CONNECTORS AND TERMINALS THOROUGHLY FOR INTERMITTENTS OR CORROSION. REFER TO "INTERMITTENTS AND POOR CONNECTIONS"
ARE CONNECTIONS AND WIRING GOOD?
NO TROUBLE FOUND; SEE "DIAGNOSTIC AIDS".
YES
NO
7
• CHECK SENSOR MOUNTING, TOOTHED WHEEL FOR DAMAGE OR FOREIGN MATERIAL. SEE "DIAGNOSTIC AIDS"
IS DAMAGE OR FOREIGN MATERIAL EVIDENT?
REPAIR WIRING AND/OR CONNECTIONS AS NEEDED;
NO
YES
8
• REPLACE SPEED SENSOR.
• CLEAR DTCs, IGNITION "OFF."
• DISCONNECT TECH 1, IF CONNECTED.
• ROAD TEST VEHICLE, REACHING AT LEAST 25 km/h (15 MPH).
DOES DTC 35 RESET?
REPAIR AS NECESSARY.
YES
NO
REPLACE EBCM.
SYSTEM OK; SEE "DIAGNOSTIC AIDS".
95E15192
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.

Fig. 14: DTC 35 Diagnostic Flow Chart - 2 Of 2
Courtesy of GENERAL MOTORS CORP.

5. Checks if DTC resets during road test.
6. Checks wiring and connectors for intermittents.
7. Checks wheel speed sensor mounting, toothed wheel and rear wheel bearing for cause of malfunction. Checks for build-up of foreign material in gaps between teeth on toothed sensor ring. Checks toothed sensor ring for large grooves, gouges and marks which may influence sensor ring signal. Inspects rear axle (wheel) speed sensor for damage and contamination.
8. Replace wheel speed sensor as likely cause of DTC reset.

Diagnostic Aids

Check for build-up of foreign material in gaps between teeth on toothed sensor ring. Check toothed sensor ring for large grooves, gouges and marks which may influence sensor ring signal. If rear axle service was performed, and toothed ring was removed, toothed ring must be replaced. Ensure sensor wires are properly twisted, routed and secured. Improper wire routing may cause DTC 21 and/or 25 to set.

To aid in trouble shooting intermittent conditions, use Tech 1 while road testing vehicle. During usage of Tech 1, ABS will be disabled. If intermittent is still not identified, wet speed sensor harness on underside of vehicle and road test while monitoring wheel speeds.

DTC 41, DTC 45 & DTC 55 - RIGHT FRONT, LEFT FRONT & REAR INLET VALVE SOLENOID FAULT

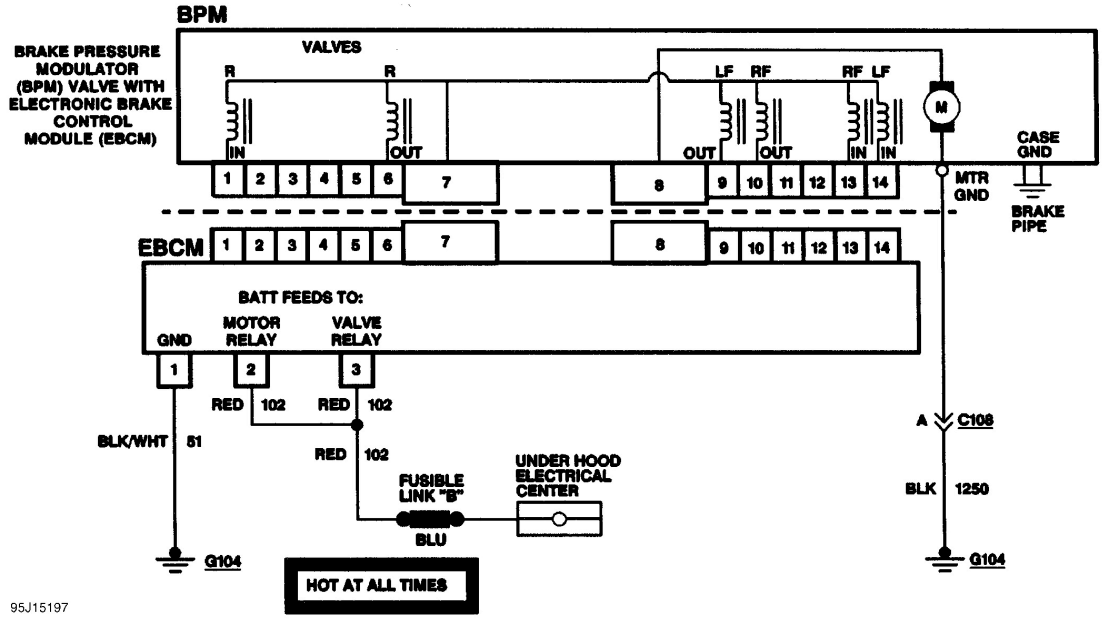

Fig. 15: Inlet Valve Solenoid System Schematic
Courtesy of GENERAL MOTORS CORP.

With ignition switch in RUN, BULB CHECK or START position, EBCM applies battery voltage to valve relay. EBCM will complete an internal self-check before providing ground to relay. When valve relay is energized, battery power is supplied to solenoid valves.

DTC will set when there is damage to solenoid, open or short to ground or battery voltage in circuit.

If a fault is detected which causes a valve DTC to set, anti-lock braking is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle. If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC will be present.

NOTE: Auto test is performed once during each ignition cycle when vehicle reaches approximately 4 MPH. Test can be heard and felt and should be considered normal. Test may also be performed using Tech 1 in MISC TESTS mode F4.

NOTE: Test numbers refer to numbers on diagnostic chart.

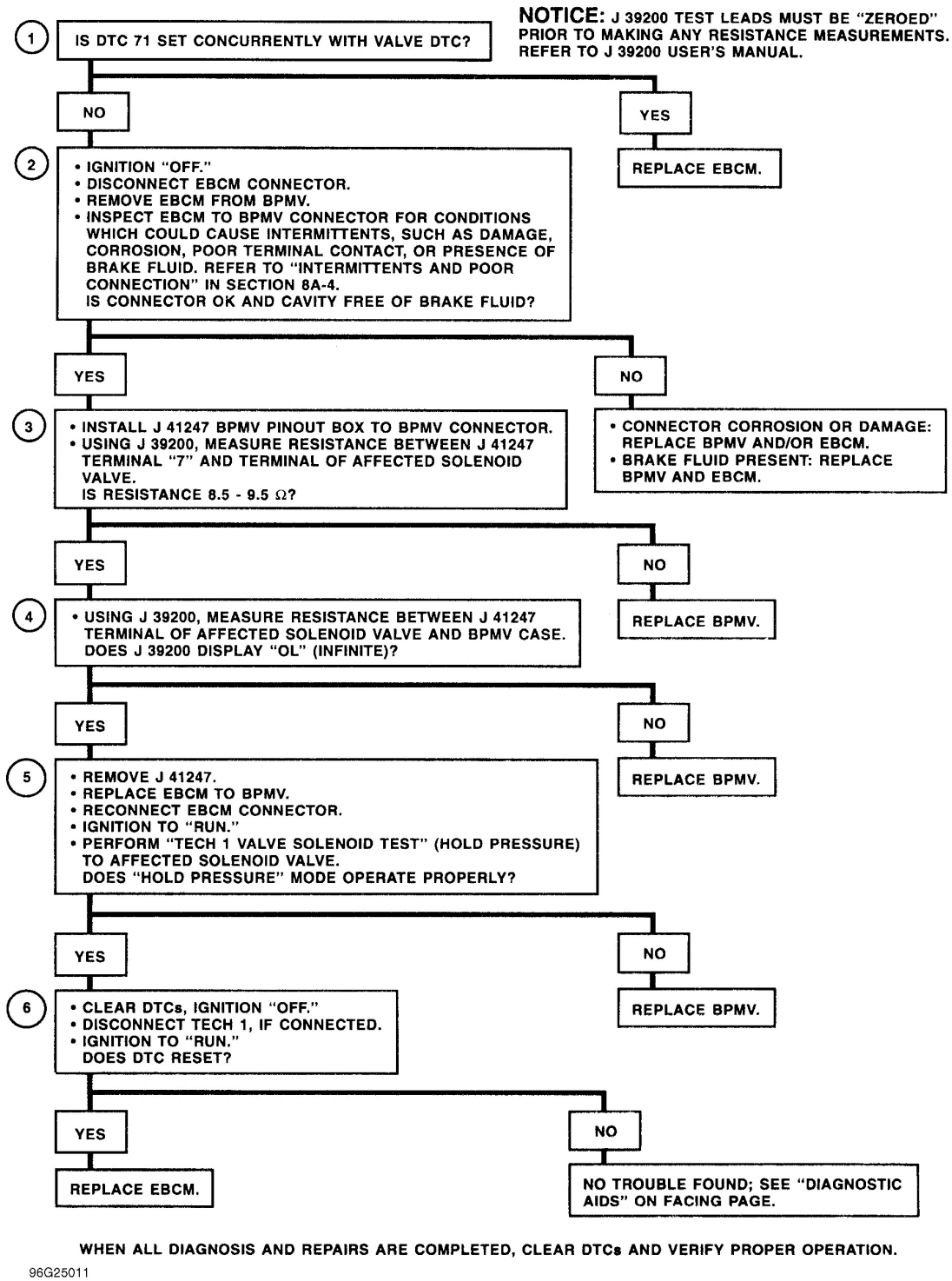
NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.
1
IS DTC 71 SET CONCURRENTLY WITH VALVE DTC?
NO
YES
REPLACE EBCM.
2
• IGNITION "OFF."
• DISCONNECT EBCM CONNECTOR.
• REMOVE EBCM FROM BPMV.
• INSPECT EBCM TO BPMV CONNECTOR FOR CONDITIONS WHICH COULD CAUSE INTERMITTENTS, SUCH AS DAMAGE, CORROSION, POOR TERMINAL CONTACT, OR PRESENCE OF BRAKE FLUID. REFER TO "INTERMITTENTS AND POOR CONNECTION" IN SECTION 8A-4.
IS CONNECTOR OK AND CAVITY FREE OF BRAKE FLUID?
YES
NO
• CONNECTOR CORROSION OR DAMAGE: REPLACE BPMV AND/OR EBCM.
• BRAKE FLUID PRESENT: REPLACE BPMV AND EBCM.
3
• INSTALL J 41247 BPMV PINOUT BOX TO BPMV CONNECTOR.
• USING J 39200, MEASURE RESISTANCE BETWEEN J 41247 TERMINAL "7" AND TERMINAL OF AFFECTED SOLENOID VALVE.
IS RESISTANCE 8.5 - 9.5 Ω?
YES
NO
REPLACE BPMV.
4
• USING J 39200, MEASURE RESISTANCE BETWEEN J 41247 TERMINAL OF AFFECTED SOLENOID VALVE AND BPMV CASE.
DOES J 39200 DISPLAY "OL" (INFINITE)?
YES
NO
REPLACE BPMV.
5
• REMOVE J 41247.
• REPLACE EBCM TO BPMV.
• RECONNECT EBCM CONNECTOR.
• IGNITION TO "RUN."
• PERFORM "TECH 1 VALVE SOLENOID TEST" (HOLD PRESSURE) TO AFFECTED SOLENOID VALVE.
DOES "HOLD PRESSURE" MODE OPERATE PROPERLY?
YES
NO
REPLACE BPMV.
6
• CLEAR DTCs, IGNITION "OFF."
• DISCONNECT TECH 1, IF CONNECTED.
• IGNITION TO "RUN."
DOES DTC RESET?
YES
NO
REPLACE EBCM.
NO TROUBLE FOUND; SEE "DIAGNOSTIC AIDS" ON FACING PAGE.
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
96G25011

Fig. 16: DTC 41, 45 & 55 Diagnostic Flow Chart
Courtesy of GENERAL MOTORS CORP.

1. Checks if DTC 71 was set concurrently with valve DTC.

2. Checks condition of EBCM-to-BPM connector and for presence of brake fluid.
3. Checks integrity of affected valve solenoid circuitry internal to BPM valve, and valve solenoid coil.
4. Checks for solenoid circuit short to ground (BPMV case).
5. Uses Tech 1 to exercise affected valve solenoid and check it for proper operation.
6. Checks for continued DTC setting after validating that circuitry and solenoid valve is good. If DTC resets, EBCM is likely malfunctioning.

Diagnostic Aids

To prevent misdiagnosis, conduct thorough inspection of wiring and connectors.

DTC 42, DTC 46 & DTC 56 - RIGHT FRONT, LEFT FRONT & REAR OUTLET VALVE SOLENOID FAULT

With ignition switch in RUN, BULB CHECK or START position, EBCM applies battery voltage to valve relay. EBCM will complete an internal self-check before providing ground to relay. When valve relay is energized, battery power is supplied to solenoid valves. See **Fig. 15**.

DTC will set when there is damage to solenoid, open or short to ground or battery voltage in circuit.

If a fault is detected which causes a valve DTC to set, anti-lock braking is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle. If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC will be present.

NOTE: Auto test is performed once during each ignition cycle when vehicle reaches approximately 4 MPH. Test can be heard and felt and should be considered normal. Test may also be performed using Tech 1 in MISC TESTS mode F4.

NOTE: Test numbers refer to numbers on diagnostic chart.

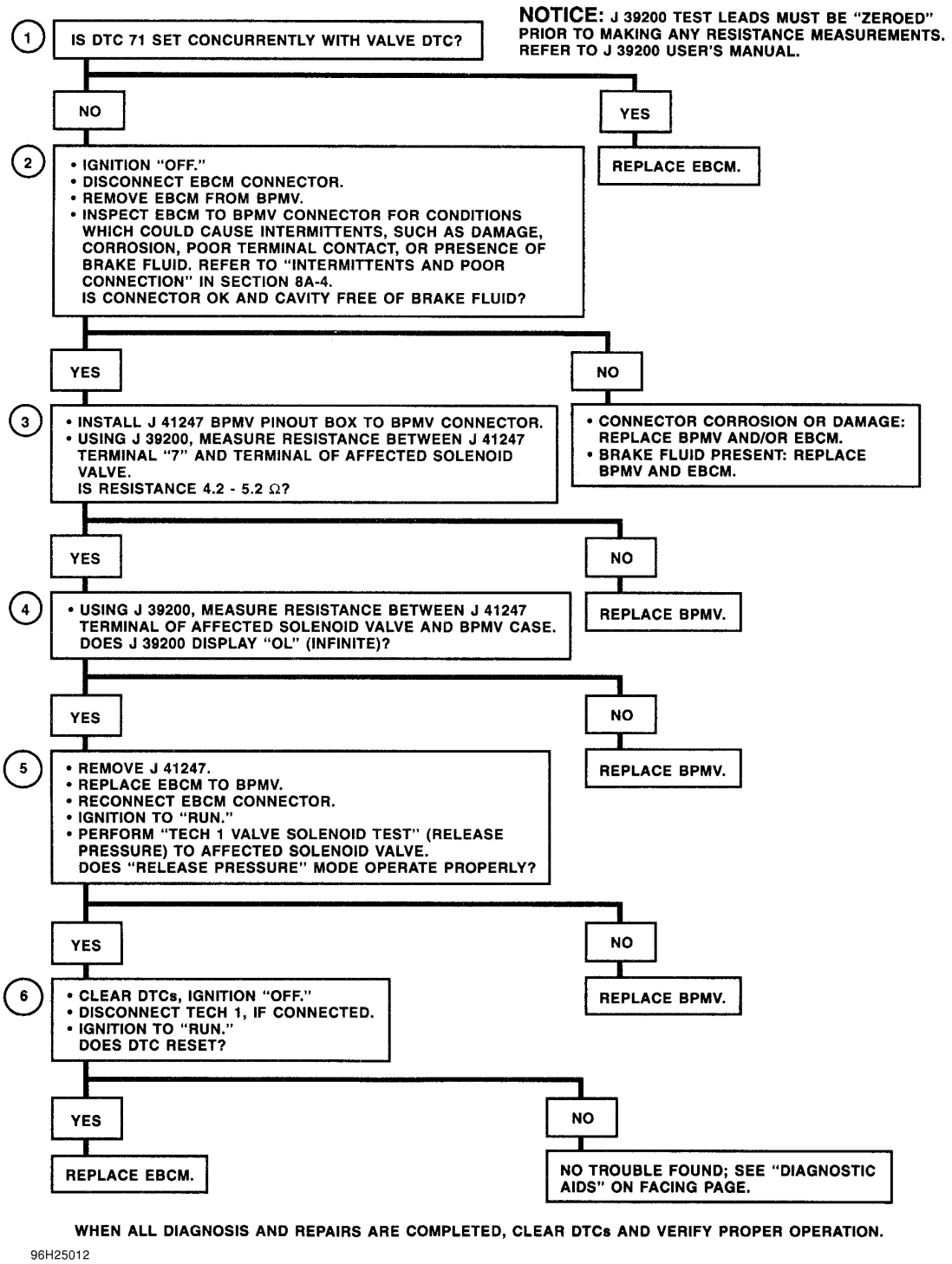
NOTICE: J 39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.
1
IS DTC 71 SET CONCURRENTLY WITH VALVE DTC?
NO
YES
REPLACE EBCM.
2
• IGNITION "OFF."
• DISCONNECT EBCM CONNECTOR.
• REMOVE EBCM FROM BPMV.
• INSPECT EBCM TO BPMV CONNECTOR FOR CONDITIONS WHICH COULD CAUSE INTERMITTENTS, SUCH AS DAMAGE, CORROSION, POOR TERMINAL CONTACT, OR PRESENCE OF BRAKE FLUID. REFER TO "INTERMITTENTS AND POOR CONNECTION" IN SECTION 8A-4.
IS CONNECTOR OK AND CAVITY FREE OF BRAKE FLUID?
YES
NO
3
• INSTALL J 41247 BPMV PINOUT BOX TO BPMV CONNECTOR.
• USING J 39200, MEASURE RESISTANCE BETWEEN J 41247 TERMINAL "7" AND TERMINAL OF AFFECTED SOLENOID VALVE.
IS RESISTANCE 4.2 - 5.2 Ω?
• CONNECTOR CORROSION OR DAMAGE: REPLACE BPMV AND/OR EBCM.
• BRAKE FLUID PRESENT: REPLACE BPMV AND EBCM.
YES
NO
4
• USING J 39200, MEASURE RESISTANCE BETWEEN J 41247 TERMINAL OF AFFECTED SOLENOID VALVE AND BPMV CASE.
DOES J 39200 DISPLAY "OL" (INFINITE)?
REPLACE BPMV.
YES
NO
5
• REMOVE J 41247.
• REPLACE EBCM TO BPMV.
• RECONNECT EBCM CONNECTOR.
• IGNITION TO "RUN."
• PERFORM "TECH 1 VALVE SOLENOID TEST" (RELEASE PRESSURE) TO AFFECTED SOLENOID VALVE.
DOES "RELEASE PRESSURE" MODE OPERATE PROPERLY?
REPLACE BPMV.
YES
NO
6
• CLEAR DTCs, IGNITION "OFF."
• DISCONNECT TECH 1, IF CONNECTED.
• IGNITION TO "RUN."
DOES DTC RESET?
REPLACE BPMV.
YES
NO
REPLACE EBCM.
NO TROUBLE FOUND; SEE "DIAGNOSTIC AIDS" ON FACING PAGE.
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
96H25012

Fig. 17: DTC 42, 46 & 56 Diagnostic Flow Chart
Courtesy of GENERAL MOTORS CORP.

1. Checks if DTC 71 was set concurrently with valve DTC.

2. Checks condition of EBCM-to-BPM connector.
3. Checks integrity of affected valve solenoid circuitry internal to BPM valve, and valve solenoid coil.
4. Checks for solenoid circuit short to ground (BPMV case).
5. Uses Tech 1 to exercise affected valve solenoid and check it for proper operation.
6. Checks for continued DTC setting after validating that circuitry and solenoid valve is good. If DTC resets, EBCM is likely malfunctioning.

Diagnostic Aids

To prevent misdiagnosis, conduct thorough inspection of wiring and connectors.

DTC 61 - BPM VALVE PUMP MOTOR FAULT

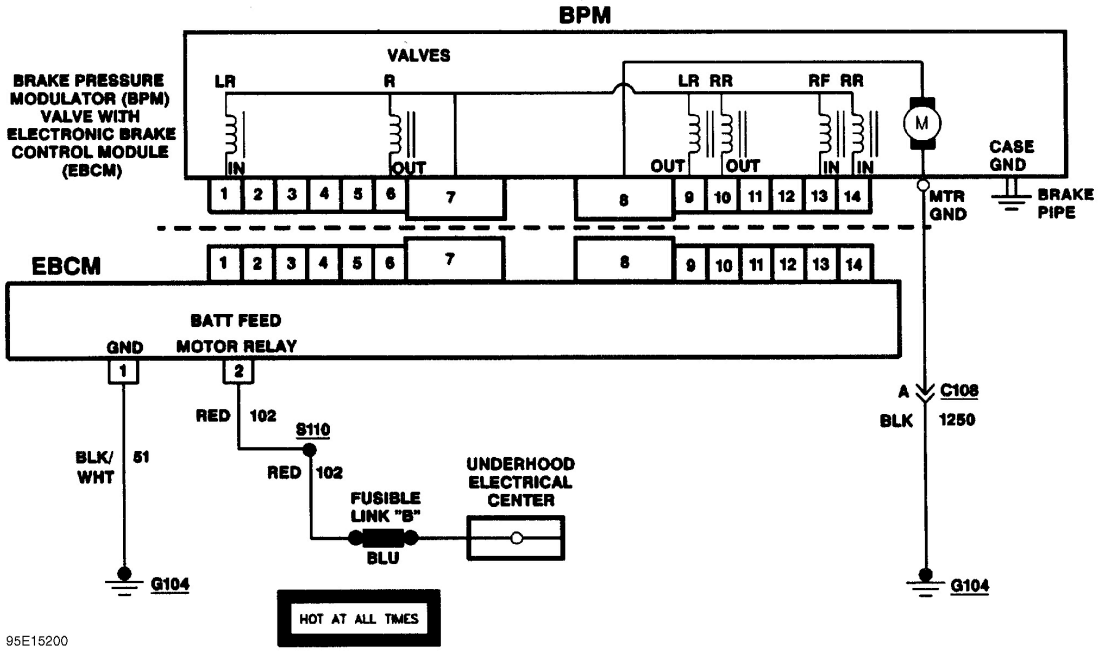

Fig. 18: BPM Valve Pump Motor System Schematic
Courtesy of GENERAL MOTORS CORP.

Pump motor returns brake fluid to master cylinder brake circuit at brake pressure modulator during anti-lock braking. During normal braking, pump does not operate. When vehicle begins to move after start-up, EBCM will turn on pump motor and perform a self-check of pump motor and pump motor circuit. This check may be felt and heard by driver when vehicle begins to move and is considered part of normal operation. Pump motor is an integral part of brake pressure modulator and cannot be serviced separately.

Pump motor relay provides power to pump motor. Pump motor relay is located in EBCM assembly and cannot be replaced.

DTC 61 will set if battery voltage is present at pump motor without pump motor being requested to activate or if battery voltage is not present at pump motor within 60 milliseconds after pump motor has been requested to activate.

If DTC 61 is set, anti-lock braking is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle. If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC 61 will be present.

NOTE: Test numbers refer to numbers on diagnostic chart.

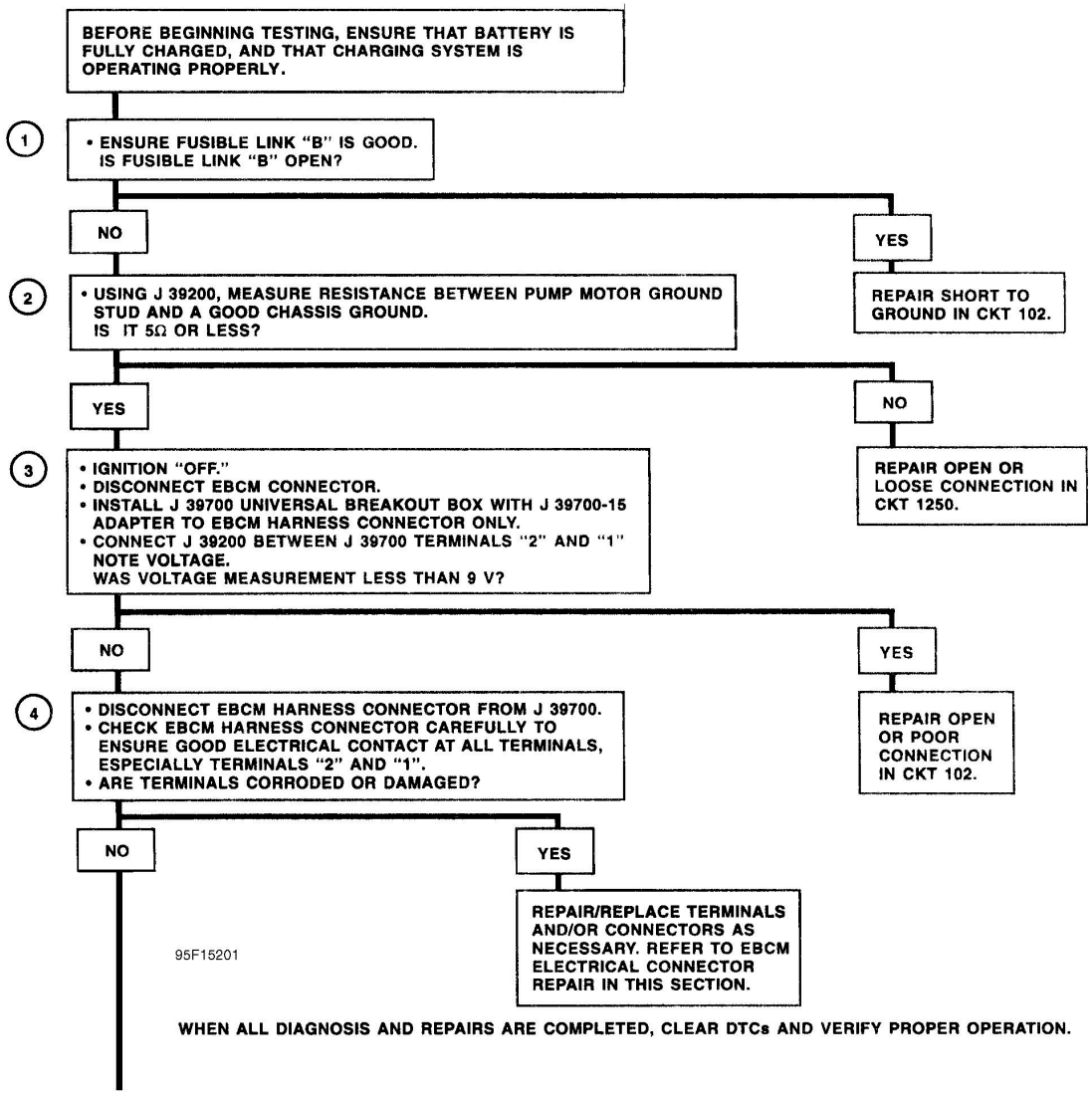
BEFORE BEGINNING TESTING, ENSURE THAT BATTERY IS FULLY CHARGED, AND THAT CHARGING SYSTEM IS OPERATING PROPERLY.
1
• ENSURE FUSIBLE LINK "B" IS GOOD. IS FUSIBLE LINK "B" OPEN?
NO
YES
REPAIR SHORT TO GROUND IN CKT 102.
2
• USING J 39200, MEASURE RESISTANCE BETWEEN PUMP MOTOR GROUND STUD AND A GOOD CHASSIS GROUND. IS IT 5Ω OR LESS?
YES
NO
REPAIR OPEN OR LOOSE CONNECTION IN CKT 1250.
3
• IGNITION "OFF."
• DISCONNECT EBCM CONNECTOR.
• INSTALL J 39700 UNIVERSAL BREAKOUT BOX WITH J 39700-15 ADAPTER TO EBCM HARNESS CONNECTOR ONLY.
• CONNECT J 39200 BETWEEN J 39700 TERMINALS "2" AND "1" NOTE VOLTAGE.
WAS VOLTAGE MEASUREMENT LESS THAN 9 V?
NO
YES
REPAIR OPEN OR POOR CONNECTION IN CKT 102.
4
• DISCONNECT EBCM HARNESS CONNECTOR FROM J 39700.
• CHECK EBCM HARNESS CONNECTOR CAREFULLY TO ENSURE GOOD ELECTRICAL CONTACT AT ALL TERMINALS, ESPECIALLY TERMINALS "2" AND "1".
• ARE TERMINALS CORRODED OR DAMAGED?
NO
YES
REPAIR/REPLACE TERMINALS AND/OR CONNECTORS AS NECESSARY. REFER TO EBCM ELECTRICAL CONNECTOR REPAIR IN THIS SECTION.
95F15201
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.

Fig. 19: DTC 61 Diagnostic Flow Chart - 1 Of 2
Courtesy of GENERAL MOTORS CORP.

1. Checks that fusible link "B" feeding EBCM motor relay circuit is good.

2. Checks for open in pump motor ground circuit No. 1250.
3. Checks for voltage from EBCM motor relay circuit, using EBCM ground to complete circuit.
4. Checks EBCM connector terminals for good contact.

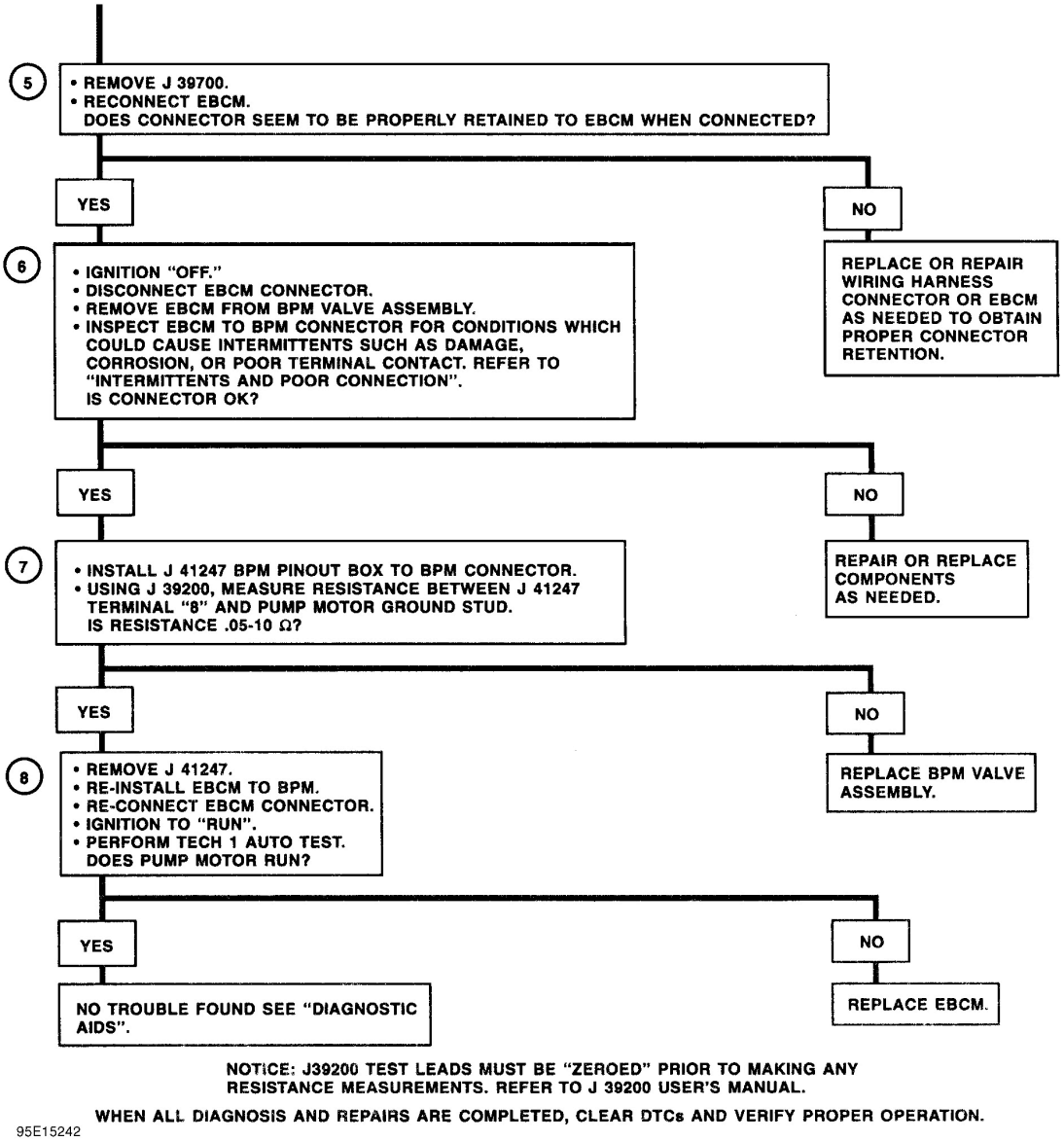
5
• REMOVE J 39700.
• RECONNECT EBCM.
DOES CONNECTOR SEEM TO BE PROPERLY RETAINED TO EBCM WHEN CONNECTED?
YES
NO
REPLACE OR REPAIR WIRING HARNESS CONNECTOR OR EBCM AS NEEDED TO OBTAIN PROPER CONNECTOR RETENTION.
6
• IGNITION "OFF."
• DISCONNECT EBCM CONNECTOR.
• REMOVE EBCM FROM BPM VALVE ASSEMBLY.
• INSPECT EBCM TO BPM CONNECTOR FOR CONDITIONS WHICH COULD CAUSE INTERMITTENTS SUCH AS DAMAGE, CORROSION, OR POOR TERMINAL CONTACT. REFER TO "INTERMITTENTS AND POOR CONNECTION".
IS CONNECTOR OK?
YES
NO
REPAIR OR REPLACE COMPONENTS AS NEEDED.
7
• INSTALL J 41247 BPM PINOUT BOX TO BPM CONNECTOR.
• USING J 39200, MEASURE RESISTANCE BETWEEN J 41247 TERMINAL "8" AND PUMP MOTOR GROUND STUD.
IS RESISTANCE .05-10 Ω?
YES
NO
REPLACE BPM VALVE ASSEMBLY.
8
• REMOVE J 41247.
• RE-INSTALL EBCM TO BPM.
• RE-CONNECT EBCM CONNECTOR.
• IGNITION TO "RUN".
• PERFORM TECH 1 AUTO TEST.
DOES PUMP MOTOR RUN?
YES
NO
REPLACE EBCM.
NO TROUBLE FOUND SEE "DIAGNOSTIC AIDS".
NOTICE: J39200 TEST LEADS MUST BE "ZEROED" PRIOR TO MAKING ANY RESISTANCE MEASUREMENTS. REFER TO J 39200 USER'S MANUAL.
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
95E15242

Fig. 20: DTC 61 Diagnostic Flow Chart - 2 Of 2
Courtesy of GENERAL MOTORS CORP.

5. Checks EBCM connector for good retention to EBCM when installed.
6. Checks condition of connector.
7. Checks integrity of pump motor and pump motor circuitry internal to BPM valve.

8. Checks operation of pump motor and circuitry, using Tech 1.

Diagnostic Aids

All tests which require a connection to pinout box pin No. 1 are using this pin as ground. This assumes integrity of ground circuit No. 51 has been maintained. To prevent misdiagnosis, conduct thorough inspection of wiring and connectors.

DTC 63 - VALVE POWER SUPPLY FAULT

Valves require a certain minimum voltage to operate properly. EBCM monitors valve feed circuit to determine if voltage falls below a minimum level. DTC 63 will set when voltage falls below 5 volts.

If DTC 63 is set, anti-lock braking is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle. If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC 63 will be present.

NOTE: Test numbers refer to numbers on diagnostic chart.

1. Checks that fusible link "B" feeding valve relay circuit is good.
2. Checks for voltage from valve circuit supply voltage.
3. Checks EBCM connector terminals for good contact.
4. Checks condition of EBCM-to-BPM connector.
5. Checks EBCM connector for good retention to EBCM when installed.
6. Checks for DTC reset after other portions of system have tested okay.

Diagnostic Aids

All tests which require a connection to pinout box pin No. 1 are using this pin as ground. This assumes integrity of ground circuit No. 51 has been maintained. To prevent misdiagnosis, conduct thorough inspection of wiring and connectors.

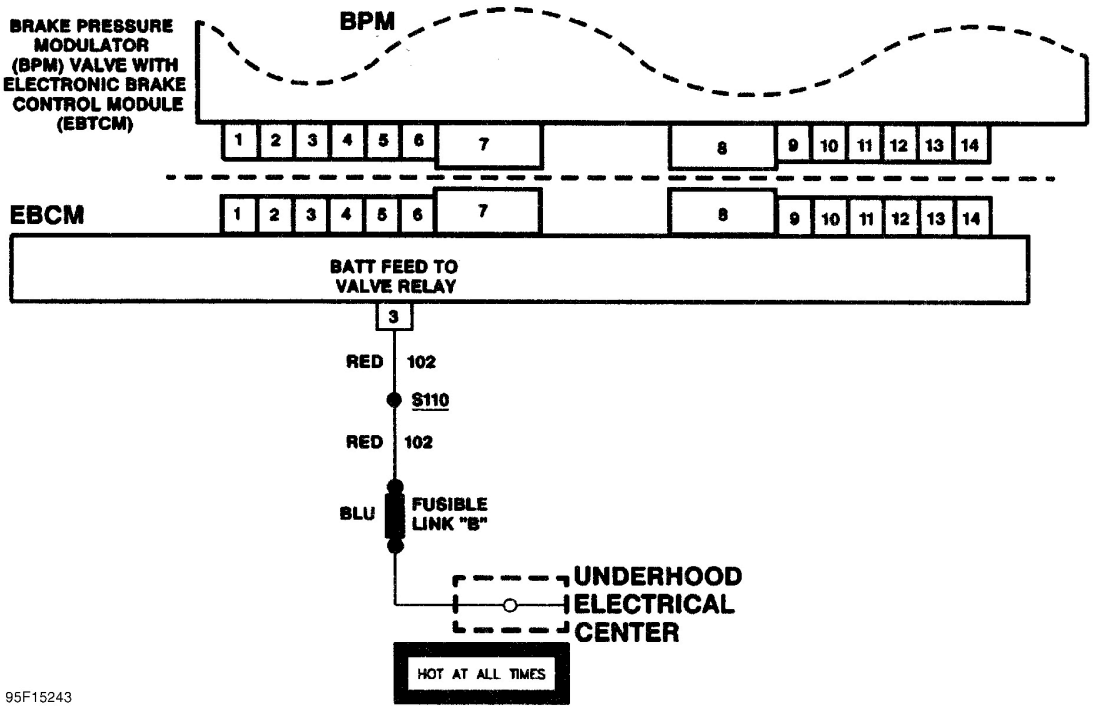
BRAKE PRESSURE MODULATOR (BPM) VALVE WITH ELECTRONIC BRAKE CONTROL MODULE (EBTCM)
BPM
1 2 3 4 5 6 7 8 9 10 11 12 13 14
EBCM
1 2 3 4 5 6 7 8 9 10 11 12 13 14
BATT FEED TO VALVE RELAY
3
RED 102
S110
RED 102
BLU
FUSIBLE LINK "B"
UNDERHOOD ELECTRICAL CENTER
HOT AT ALL TIMES
95F15243

Fig. 21: Valve Power Supply System Schematic
Courtesy of GENERAL MOTORS CORP.

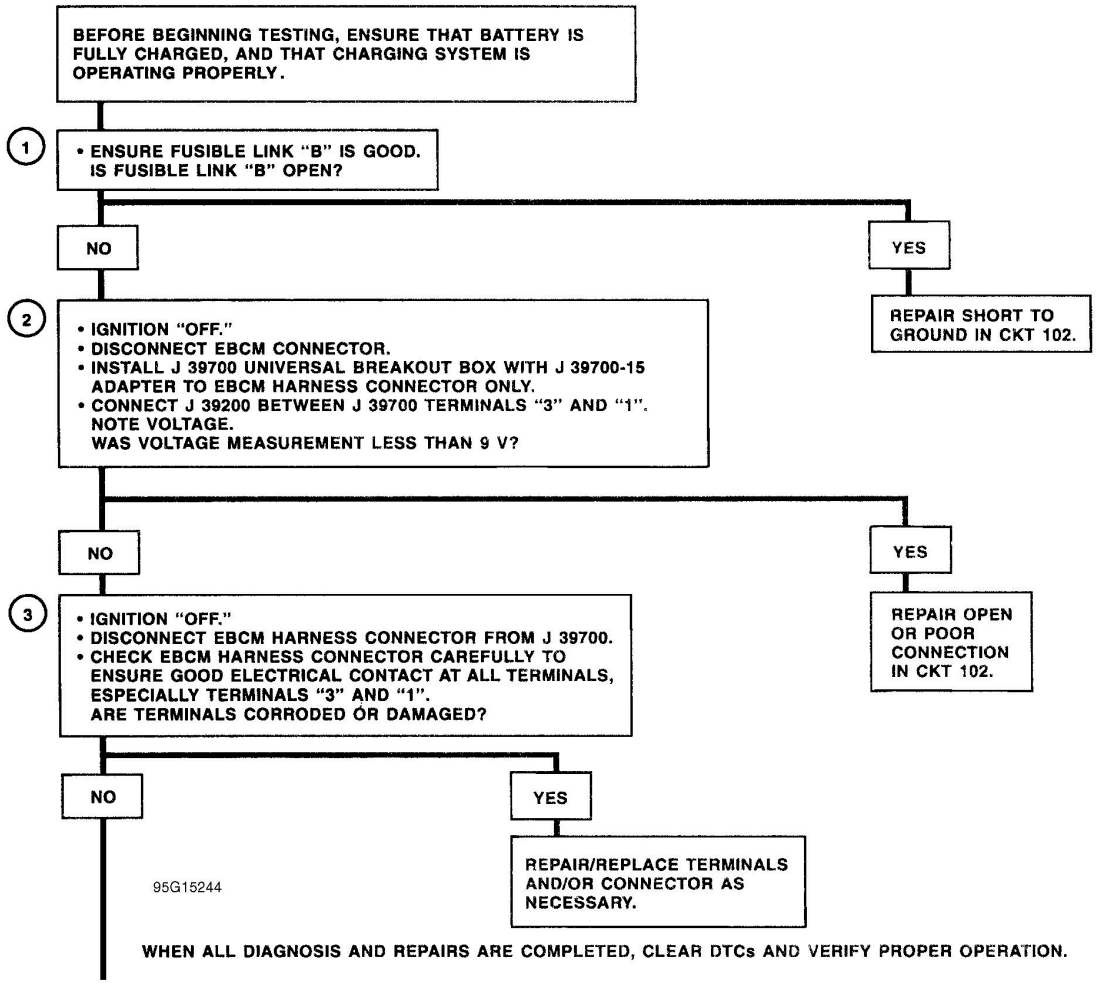
BEFORE BEGINNING TESTING, ENSURE THAT BATTERY IS FULLY CHARGED, AND THAT CHARGING SYSTEM IS OPERATING PROPERLY.
1
• ENSURE FUSIBLE LINK "B" IS GOOD.
IS FUSIBLE LINK "B" OPEN?
NO
YES
REPAIR SHORT TO GROUND IN CKT 102.
2
• IGNITION "OFF."
• DISCONNECT EBCM CONNECTOR.
• INSTALL J 39700 UNIVERSAL BREAKOUT BOX WITH J 39700-15 ADAPTER TO EBCM HARNESS CONNECTOR ONLY.
• CONNECT J 39200 BETWEEN J 39700 TERMINALS "3" AND "1". NOTE VOLTAGE.
WAS VOLTAGE MEASUREMENT LESS THAN 9 V?
NO
YES
REPAIR OPEN OR POOR CONNECTION IN CKT 102.
3
• IGNITION "OFF."
• DISCONNECT EBCM HARNESS CONNECTOR FROM J 39700.
• CHECK EBCM HARNESS CONNECTOR CAREFULLY TO ENSURE GOOD ELECTRICAL CONTACT AT ALL TERMINALS, ESPECIALLY TERMINALS "3" AND "1".
ARE TERMINALS CORRODED OR DAMAGED?
NO
YES
REPAIR/REPLACE TERMINALS AND/OR CONNECTOR AS NECESSARY.
95G15244
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.

Fig. 22: DTC 63 Diagnostic Flow Chart (1 Of 2)
Courtesy of GENERAL MOTORS CORP.

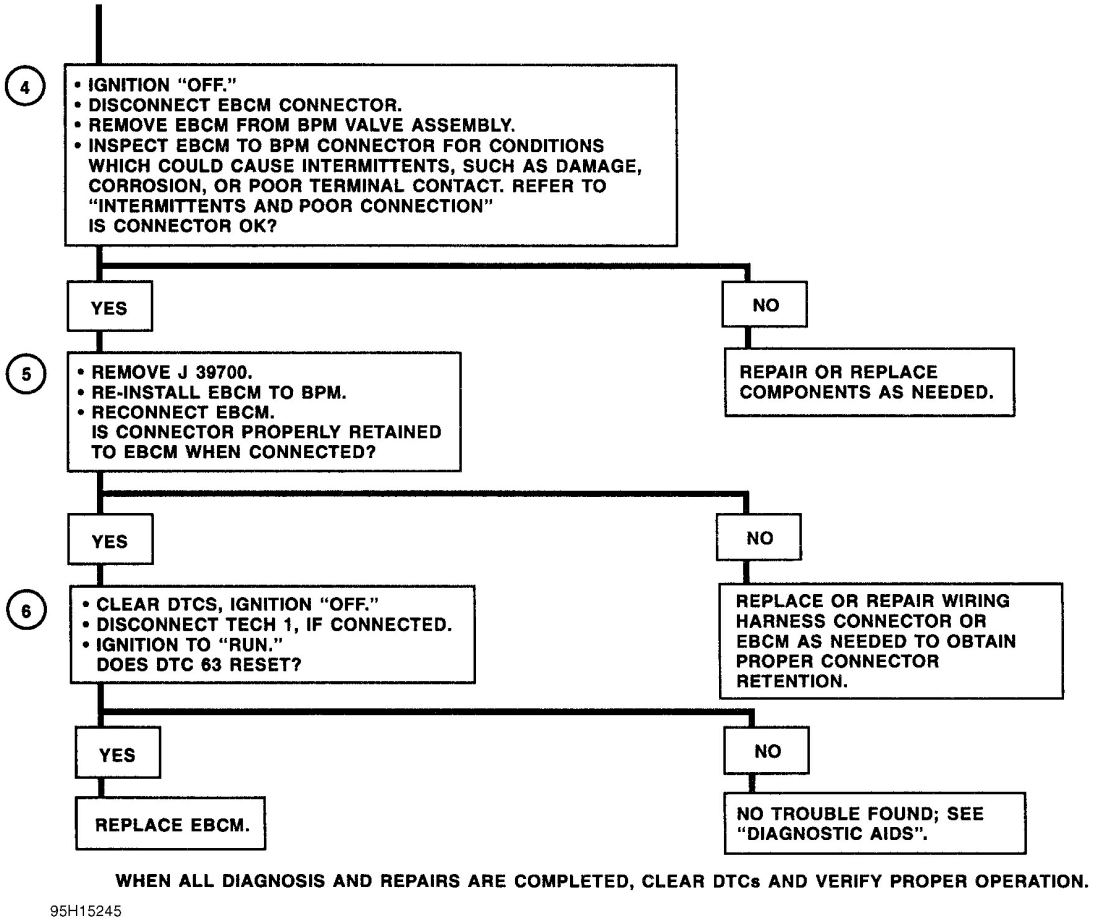
4
• IGNITION "OFF."
• DISCONNECT EBCM CONNECTOR.
• REMOVE EBCM FROM BPM VALVE ASSEMBLY.
• INSPECT EBCM TO BPM CONNECTOR FOR CONDITIONS WHICH COULD CAUSE INTERMITTENTS, SUCH AS DAMAGE, CORROSION, OR POOR TERMINAL CONTACT. REFER TO "INTERMITTENTS AND POOR CONNECTION"
IS CONNECTOR OK?
YES
NO
REPAIR OR REPLACE COMPONENTS AS NEEDED.
5
• REMOVE J 39700.
• RE-INSTALL EBCM TO BPM.
• RECONNECT EBCM.
IS CONNECTOR PROPERLY RETAINED TO EBCM WHEN CONNECTED?
YES
NO
REPLACE OR REPAIR WIRING HARNESS CONNECTOR OR EBCM AS NEEDED TO OBTAIN PROPER CONNECTOR RETENTION.
6
• CLEAR DTCS, IGNITION "OFF."
• DISCONNECT TECH 1, IF CONNECTED.
• IGNITION TO "RUN."
DOES DTC 63 RESET?
YES
NO
REPLACE EBCM.
NO TROUBLE FOUND; SEE "DIAGNOSTIC AIDS".
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
95H15245

Fig. 23: DTC 63 Diagnostic Flow Chart (2 Of 2)
Courtesy of GENERAL MOTORS CORP.

DTC 71 - EBCM FAULT

EBCM has self-diagnostics which can detect internal failure within module. EBCM also monitors supply voltage and integrity of EBCM harness connection. See **Fig. 18**.

DTC 71 will set when EBCM detects an internal fault or pump motor supply circuit is open or shorted to ground (open fuse).

If a failure is detected and sets a DTC 71, anti-lock brake system is disabled and EBCM turns on ANTI-LOCK indicator for remainder of ignition cycle.

If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC 71 will be present.

NOTE: Test numbers refer to numbers on diagnostic chart.

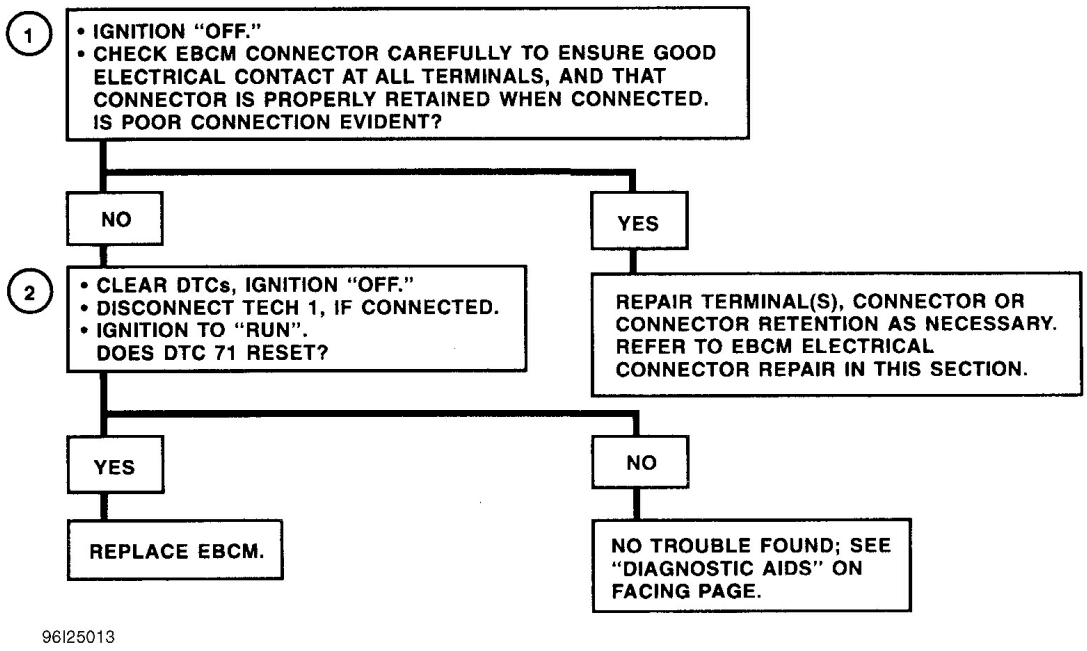
1
• IGNITION "OFF."
• CHECK EBCM CONNECTOR CAREFULLY TO ENSURE GOOD ELECTRICAL CONTACT AT ALL TERMINALS, AND THAT CONNECTOR IS PROPERLY RETAINED WHEN CONNECTED.
IS POOR CONNECTION EVIDENT?
NO
YES
2
• CLEAR DTCs, IGNITION "OFF."
• DISCONNECT TECH 1, IF CONNECTED.
• IGNITION TO "RUN".
DOES DTC 71 RESET?
REPAIR TERMINAL(S), CONNECTOR OR CONNECTOR RETENTION AS NECESSARY. REFER TO EBCM ELECTRICAL CONNECTOR REPAIR IN THIS SECTION.
YES
NO
REPLACE EBCM.
NO TROUBLE FOUND; SEE "DIAGNOSTIC AIDS" ON FACING PAGE.
96I25013

Fig. 24: DTC 71 Diagnostic Flow Chart
Courtesy of GENERAL MOTORS CORP.

1. Checks for good connections from harness to EBCM.
2. Checks to see if fault was false. If DTC 71 resets, replace EBCM.

Diagnostic Aids

An open pump motor supply circuit (open fuse) will cause DTC 71 to set. Check that fusible link "B" feeding pump motor relay is good. To prevent misdiagnosis, conduct thorough inspection of wiring and connectors.

DTC 85 - LOW VOLTAGE

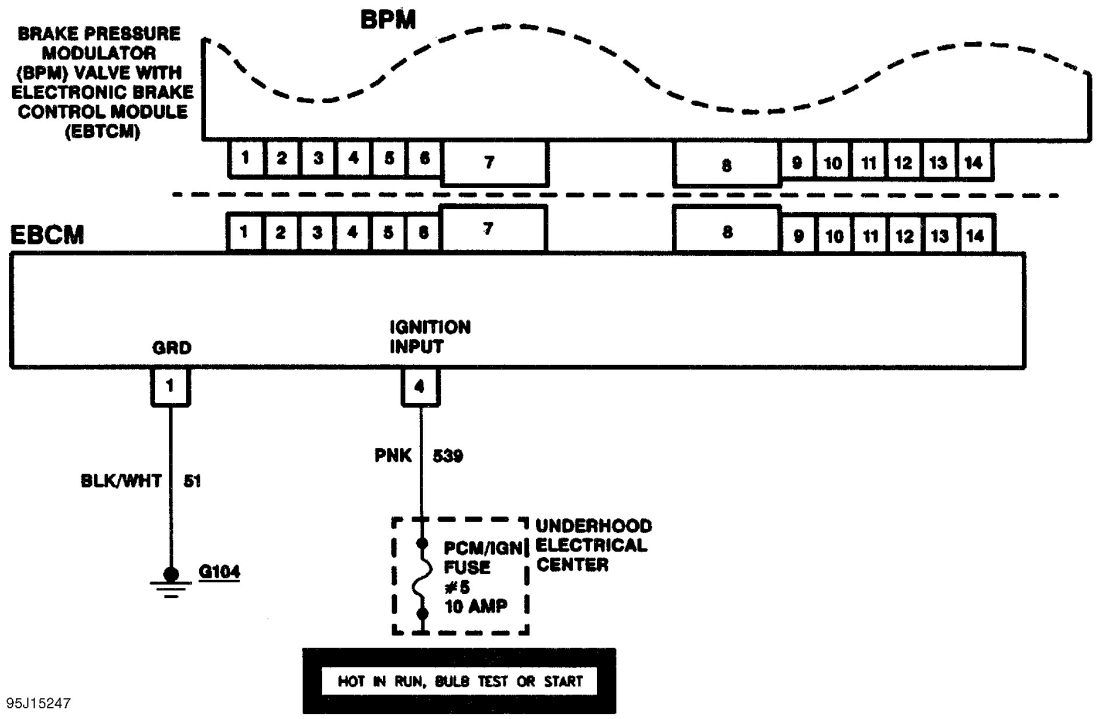
BRAKE PRESSURE MODULATOR (BPM) VALVE WITH ELECTRONIC BRAKE CONTROL MODULE (EBTCM)
BPM
1 2 3 4 5 6 7 8 9 10 11 12 13 14
EBCM
1 2 3 4 5 6 7 8 9 10 11 12 13 14
GRD
IGNITION INPUT
1
4
PNK 539
BLK/WHT 51
G104
PCM/IGN FUSE #5 10 AMP
UNDERHOOD ELECTRICAL CENTER
HOT IN RUN, BULB TEST OR START
95J15247

Fig. 25: ECBM Power System Schematic
Courtesy of GENERAL MOTORS CORP.

EBCM requires a certain minimum voltage to operate properly. EBCM monitors ignition feed circuit to determine if voltage falls below a minimum level.

DTC 85 will set when EBCM operating voltage falls below 9.4 volts out of ABS control, 8.8 volts during ABS control and low voltage is detected for more than 500 milliseconds with vehicle speed above 3.6 MPH.

When low voltage is detected, ABS valves are switched to passive, which prevents possible pump start-up and ANTI-LOCK indicator will be on.

If failure is intermittent, EBCM will enable system at next ignition cycle and a history DTC 85 will be present.

NOTE: Test numbers refer to numbers on diagnostic chart.

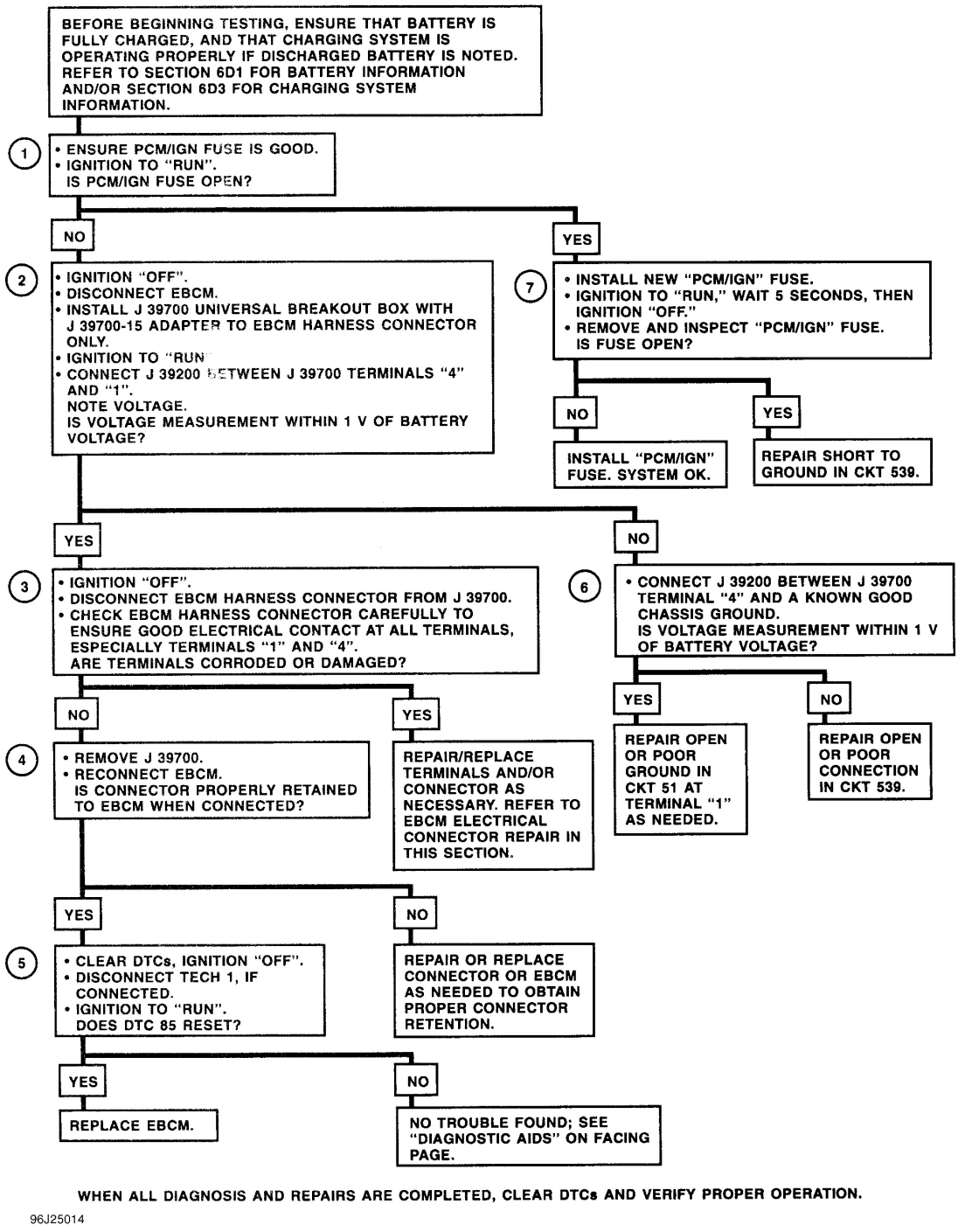
BEFORE BEGINNING TESTING, ENSURE THAT BATTERY IS FULLY CHARGED, AND THAT CHARGING SYSTEM IS OPERATING PROPERLY IF DISCHARGED BATTERY IS NOTED. REFER TO SECTION 6D1 FOR BATTERY INFORMATION AND/OR SECTION 6D3 FOR CHARGING SYSTEM INFORMATION.
1
• ENSURE PCM/IGN FUSE IS GOOD.
• IGNITION TO "RUN".
IS PCM/IGN FUSE OPEN?
NO
YES
2
• IGNITION "OFF".
• DISCONNECT EBCM.
• INSTALL J 39700 UNIVERSAL BREAKOUT BOX WITH J 39700-15 ADAPTER TO EBCM HARNESS CONNECTOR ONLY.
• IGNITION TO "RUN".
• CONNECT J 39200 BETWEEN J 39700 TERMINALS "4" AND "1".
NOTE VOLTAGE.
IS VOLTAGE MEASUREMENT WITHIN 1 V OF BATTERY VOLTAGE?
7
• INSTALL NEW "PCM/IGN" FUSE.
• IGNITION TO "RUN," WAIT 5 SECONDS, THEN IGNITION "OFF."
• REMOVE AND INSPECT "PCM/IGN" FUSE.
IS FUSE OPEN?
NO
YES
INSTALL "PCM/IGN" FUSE. SYSTEM OK.
REPAIR SHORT TO GROUND IN CKT 539.
YES
NO
3
• IGNITION "OFF".
• DISCONNECT EBCM HARNESS CONNECTOR FROM J 39700.
• CHECK EBCM HARNESS CONNECTOR CAREFULLY TO ENSURE GOOD ELECTRICAL CONTACT AT ALL TERMINALS, ESPECIALLY TERMINALS "1" AND "4".
ARE TERMINALS CORRODED OR DAMAGED?
6
• CONNECT J 39200 BETWEEN J 39700 TERMINAL "4" AND A KNOWN GOOD CHASSIS GROUND.
IS VOLTAGE MEASUREMENT WITHIN 1 V OF BATTERY VOLTAGE?
NO
YES
YES
NO
4
• REMOVE J 39700.
• RECONNECT EBCM.
IS CONNECTOR PROPERLY RETAINED TO EBCM WHEN CONNECTED?
REPAIR/REPLACE TERMINALS AND/OR CONNECTOR AS NECESSARY. REFER TO EBCM ELECTRICAL CONNECTOR REPAIR IN THIS SECTION.
REPAIR OPEN OR POOR GROUND IN CKT 51 AT TERMINAL "1" AS NEEDED.
REPAIR OPEN OR POOR CONNECTION IN CKT 539.
YES
NO
5
• CLEAR DTCs, IGNITION "OFF".
• DISCONNECT TECH 1, IF CONNECTED.
• IGNITION TO "RUN".
DOES DTC 85 RESET?
REPAIR OR REPLACE CONNECTOR OR EBCM AS NEEDED TO OBTAIN PROPER CONNECTOR RETENTION.
YES
NO
REPLACE EBCM.
NO TROUBLE FOUND; SEE "DIAGNOSTIC AIDS" ON FACING PAGE.
WHEN ALL DIAGNOSIS AND REPAIRS ARE COMPLETED, CLEAR DTCs AND VERIFY PROPER OPERATION.
96J25014

Fig. 26: DTC 85 Diagnostic Flow Chart
Courtesy of GENERAL MOTORS CORP.

1. Checks that PCM/IGN fuse feeding EBCM ignition circuit is good.
2. Checks for voltage from EBCM ignition circuit.

3. Checks EBCM connector terminals for good contact.
4. Checks EBCM connector for good retention when connected to EBCM.
5. Checks for DTC 85 reset after other portions of system tested okay.
6. Checks if fault found in step 2) is due to open or poor connection in EBCM ignition feed circuit No. 539, or poor ground in circuit No. 51.
7. Checks whether fuse failure is due to short to ground.

Diagnostic Aids

To prevent misdiagnosis, conduct thorough inspection of wiring and connectors.

REMOVAL & INSTALLATION

CAUTION: When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

BRAKE PRESSURE MODULATOR

Removal

1. Remove Electronic Brake Control Module (EBCM). See **ELECTRONIC BRAKE CONTROL MODULE (EBCM)**. Remove BPM mounting insulators. See **Fig. 27**. Remove ground wire from pump motor.
2. Note location of brakelines, and remove lines. Plug brakelines to prevent loss and contamination of fluid. Remove brake pressure modulator from bracket.

NOTE: When removing brake pressure modulator valve, protect vehicle exterior from possible brake fluid spillage.

Installation

1. To install, reverse removal procedure. Ensure brakelines are installed in original locations. See **Fig. 27**. Tighten brake pressure modulator mounting bolts, nuts and brakelines to specification. See **TORQUE SPECIFICATIONS**.
2. Refill brake master cylinder, bleed brakes and check for leaks. See **BLEEDING BRAKE SYSTEM**. Perform ABS functional check. See **Fig. 1**.

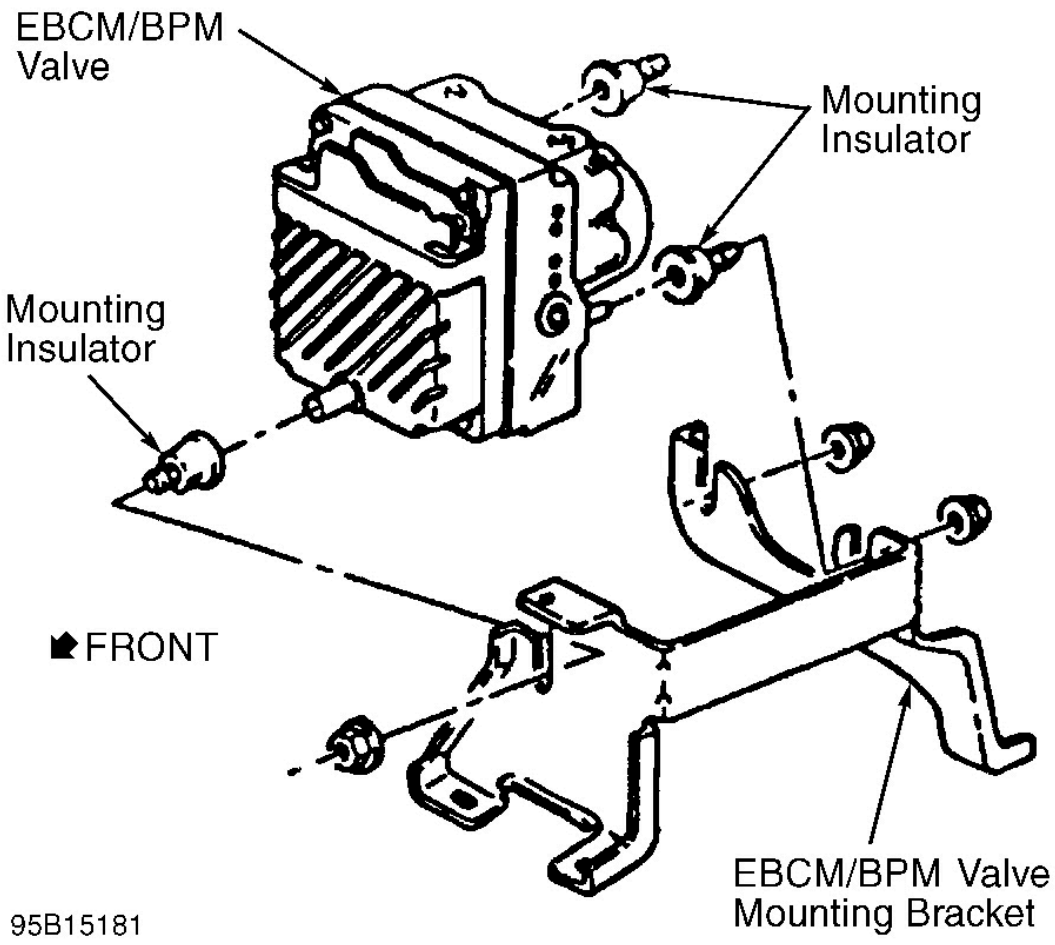

Fig. 27: Removing Brake Pressure Modulator
Courtesy of GENERAL MOTORS CORP.

ELECTRONIC BRAKE CONTROL MODULE

CAUTION: To prevent EBCM damage, never disconnect EBCM wiring harness connector with ignition on.

Removal & Installation

1. EBCM is mounted to Brake Pressure Modulator (BPM) located on left side of engine compartment, left of alternator. Disconnect negative battery cable. Remove air intake duct and resonator.
2. Unlock tab and disconnect EBCM connector. Disconnect EBCM ground wire. Remove EBCM/BPM assembly-to-bracket nuts. Remove brakeline clip bolt, downstream of EBCM/BPM valve. Raise and support EBCM/BPM valve with wood block.

3. Remove EBCM-to-BPM bolts. Remove EBCM front mounting insulator bolt. Carefully separate EBCM from BPM valve. DO NOT pry EBCM from BPM, if seal is damaged EBCM must be replaced.
4. To install, reverse removal procedure. Tighten bolts and nuts to specification. See **TORQUE SPECIFICATIONS**. Ensure EBCM connector is fully seated and tab is locked. Perform ABS functional check. See **Fig. 1**.

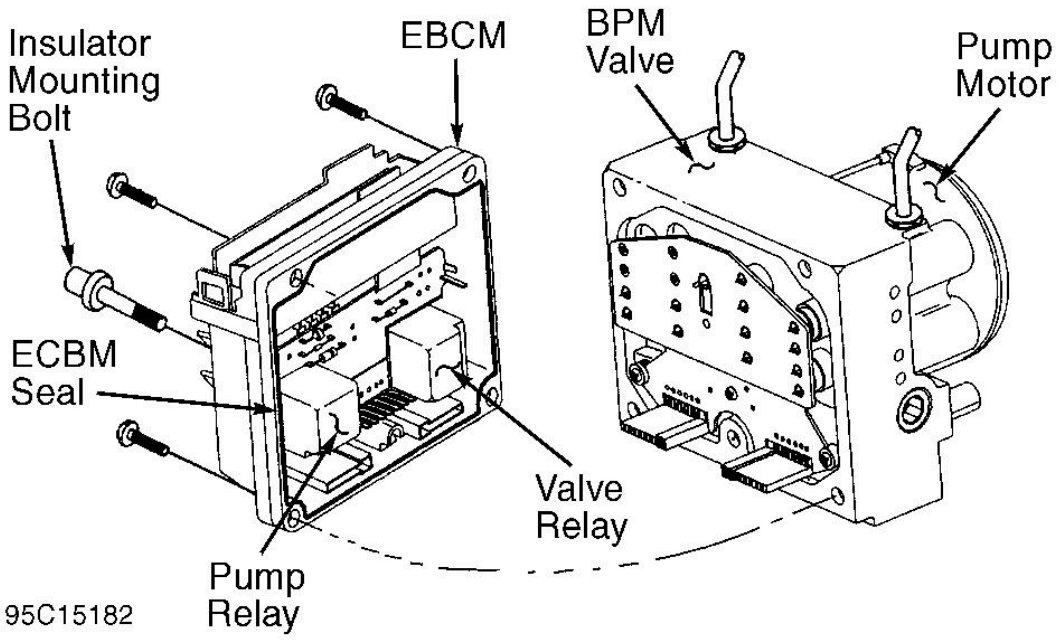

Fig. 28: Removing Electronic Brake Control Module
Courtesy of GENERAL MOTORS CORP.

WHEEL SPEED SENSOR

Removal (Front)

Front wheel speed sensor is mounted in steering knuckle. Disconnect wheel speed sensor electrical connector at strut tower. Raise and support vehicle. Remove tire and wheel assembly. Note wiring harness routing for installation reference. Remove sensor wiring harness with grommets from brackets. Remove sensor mounting bolt, and remove sensor from steering knuckle.

NOTE: Wheel speed sensors fit tightly into steering knuckle and are installed by hand. DO NOT hammer sensors into position.

Installation

1. To install, reverse removal procedure. Coat steering knuckle and speed sensor with Anti-Corrosion

Compound (12345489) before installing. DO NOT use grease. Tighten sensor mounting bolt to specification. See **TORQUE SPECIFICATIONS**.

2. Ensure wiring harness is routed in original location and properly installed in retainers. Sensor air gap is not adjustable.

Removal (Rear)

1. Rear axle (wheel) speed sensor is mounted in rear axle differential. Raise and support vehicle. Disconnect sensor wiring harness connector.
2. Note wiring harness routing for installation reference. Remove sensor wiring harness with grommets from brackets. Remove sensor mounting bolt and remove sensor from rear axle housing.

Installation

1. To install, reverse removal procedure. Sensor fits tightly into rear axle housing. DO NOT use force to install sensor. Use hand pressure only.
2. Tighten sensor mounting bolt to specification. See **TORQUE SPECIFICATIONS**. Ensure wiring harness is routed in original location and properly installed in retainers. Sensor air gap is not adjustable.

TOOTHED SENSOR RING

Removal (Front)

1. Front toothed sensor ring is an integral part of front brake rotor. If sensor ring requires replacement, brake rotor must be replaced.
2. Raise and support vehicle. Remove tire and wheel assembly. Using a "C" clamp, bottom piston into caliper bore. Remove caliper mounting bolts and sleeves. Remove brake caliper, and wire aside. Remove brake rotor.

Installation

To install, reverse removal procedure. Tighten bolts to specification. See **TORQUE SPECIFICATIONS**.

Removal & Installation (Rear)

1. Rear toothed sensor ring is an integral part of rear axle differential pinion gear. To inspect sensor ring, remove rear axle (wheel) speed sensor. See **WHEEL SPEED SENSOR**.
2. Using a flashlight and mirror, inspect sensor ring through sensor mounting hole. Check for missing or damaged teeth. If sensor ring needs replacement, differential pinion gear must be removed. See **DIFFERENTIAL & AXLE SHAFTS** article in DRIVE AXLES section.

ADJUSTMENTS

PARKING/EMERGENCY BRAKE

Depress parking brake lever 6 ratchet clicks. Raise and support vehicle. Tighten adjusting nut at parking brake

equalizer rod until right rear wheel can be turned rearward but not forward. Release parking brake. Both rear wheels should turn freely. If both wheels do not turn freely, repeat procedure. Lower vehicle.

BRAKELIGHT SWITCH

Hold brake pedal in depressed position. Insert brakelight switch into retainer until switch body seats on retainer. Pull brake pedal upward against internal pedal stop. Switch will be moved in retainer by brake pedal to provide proper adjustment.

TORQUE SPECIFICATIONS

TORQUE SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Brake Caliper Bolts	38 (51)
Brakeline-To-Brake Pressure Modulator Valve	12 (16)
EBCM Insulator Bolt	11 (15)
Wheel Lug Nuts	103 (140)
	INCH Lbs. (N.m)
Brake Pressure Modulator	
Valve Ground Wire Nut	25 (2.8)
EBCM/BPM Assembly-To-Bracket Nut	89 (10)
EBCM-To-BPM Bolt	18 (2)
Front Wheel Speed Sensor Bolt	71 (8)
Front Wheel Speed Sensor Wiring Bracket Bolt	89 (10)
Rear Axle (Wheel) Speed Sensor Bolt	71 (8)
Rear Axle (Wheel) Speed	
Sensor Wiring Bracket Bolt	71 (8)

WIRING DIAGRAM

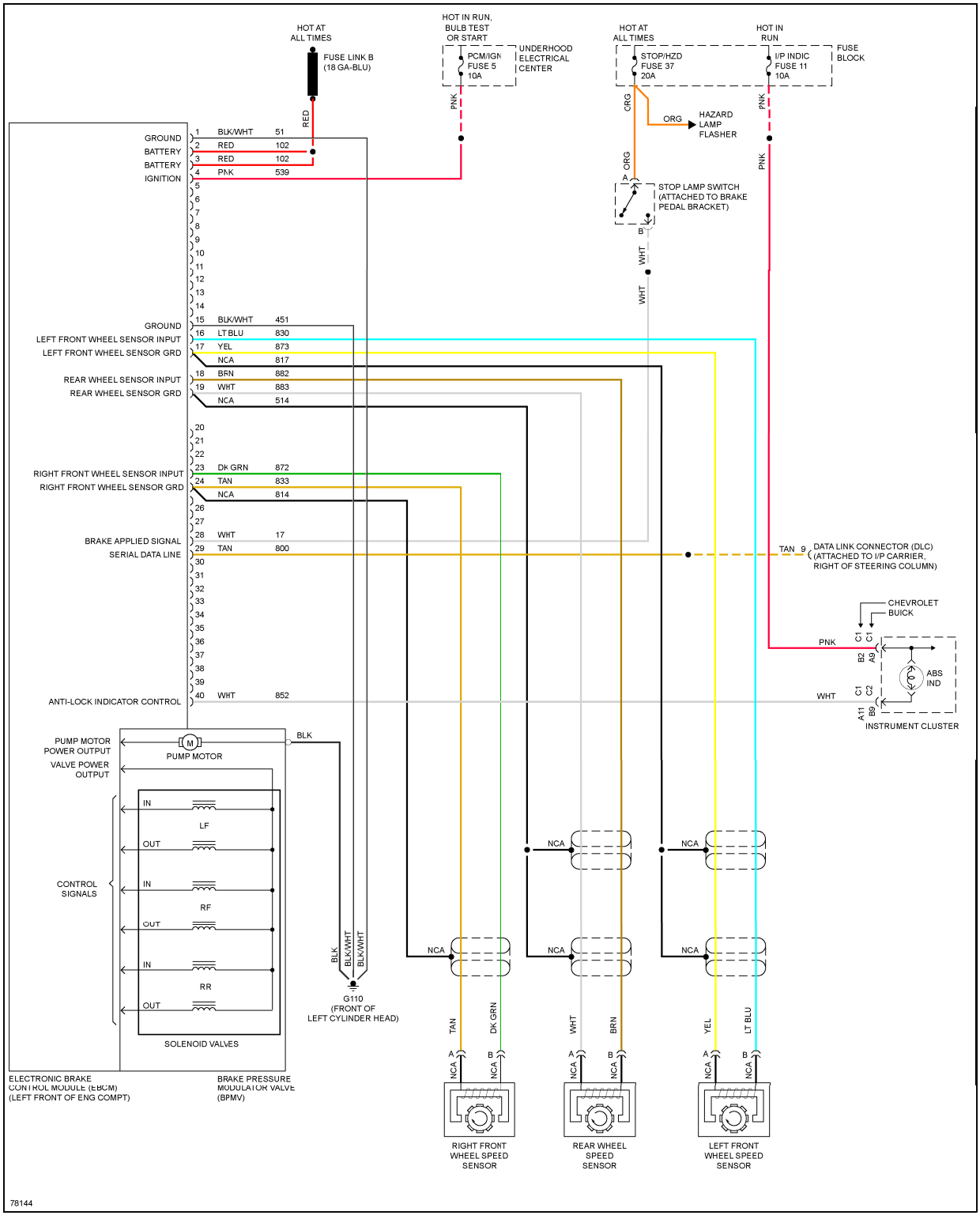
HOT AT ALL TIMES
FUSE LINK B (18 GA-BLU)
HOT IN RUN, BULB TEST OR START
PCM/IGN FUSE 5 10A
UNDERHOOD ELECTRICAL CENTER
HOT AT ALL TIMES
STOP/HZD FUSE 37 20A
HOT IN RUN
I/P INDIC FUSE 11 10A
FUSE BLOCK
HAZARD LAMP FLASHER
STOP LAMP SWITCH (ATTACHED TO BRAKE PEDAL BRACKET)
GROUND
BATTERY
BATTERY
IGNITION
LEFT FRONT WHEEL SENSOR INPUT
LEFT FRONT WHEEL SENSOR GRD
REAR WHEEL SENSOR INPUT
REAR WHEEL SENSOR GRD
RIGHT FRONT WHEEL SENSOR INPUT
RIGHT FRONT WHEEL SENSOR GRD
BRAKE APPLIED SIGNAL
SERIAL DATA LINE
ANTI-LOCK INDICATOR CONTROL
DATA LINK CONNECTOR (DLC) (ATTACHED TO I/P CARRIER, RIGHT OF STEERING COLUMN)
CHEVROLET
BUICK
ABS IND
INSTRUMENT CLUSTER
PUMP MOTOR POWER OUTPUT
VALVE POWER OUTPUT
PUMP MOTOR
CONTROL SIGNALS
SOLENOID VALVES
ELECTRONIC BRAKE CONTROL MODULE (EBCM) (LEFT FRONT OF ENG COMPT)
BRAKE PRESSURE MODULATOR VALVE (BPMV)
G110 (FRONT OF LEFT CYLINDER HEAD)
RIGHT FRONT WHEEL SPEED SENSOR
REAR WHEEL SPEED SENSOR
LEFT FRONT WHEEL SPEED SENSOR
78144

Fig. 29: Anti-Lock Brake System Wiring Diagram